Mary E. Bartlett Memorial Library

Amphitheater Improvement Project

22 Dalton Road
Brentwood, New Hampshire

CONTRACT DOCUMENTS AND TECHNICAL SPECIFICATIONS

October 2, 2023

Prepared by

Ironwood Design Group, LLC
Landscape Architects
PO Box 873
Exeter, NH 03833
603.772.0590

Table of Contents

INVITATION TO BID

MARY E. BARTLETT MEMORIAL LIBRARY - AMPHITHEATHER

The Town of Brentwood is soliciting sealed bids from qualified contractors for the materials and erection of an amphitheater at the Mary E. Bartlett Memorial Library located at 22 Dalton Rd, Brentwood, NH 03833.

BID REQUIREMENTS:

A. Contractor project bid submittals will be received by the Library Director Janice Wiers at the Mary E. Bartlett Memorial Library, 22 Dalton Road, Brentwood, NH until 11:00am local time on Friday October 27, 2023.

   Project bid submittals must be submitted in a sealed envelope addressed and clearly labeled "SEALED BID- MEB AMPHITHEATER."

   Two (2) complete copies of the signed Bid Form and the signed Contract Agreement shall be furnished for each submittal.

   Submittals received after this time will not be accepted. No late bids, telephone, faxed, or emailed bids will be accepted. All submittals shall be provided on the project Bid Form to be completed in full and accompanied by the Contract Agreement as well as requested supporting information to be considered responsive. Submittals may be disqualified for incompletion or missing information.

   Bidders shall assume all costs and expenses associated with the preparation and submission of their submitted project bid.

   An optional pre-bid meeting will be held at the library on Tuesday October 10, 2023 at 2:30pm.

   The Library Trustees will select and notify the chosen Contractor the week of November 6, 2023.

B. In the Bid Form, bidders must provide a lump sum guaranteed price quote for all aspects of the work, including, but not limited to all materials, labor, equipment, disposal, subcontractors, and clean-up associated with the project.

C. Bidders should note that the library will remain open to the public and work must be safely separated from library patrons. When working on site, public access should be coordinated daily with the Library Director.

D. Interested firms are required to provide evidence of their qualifications and experience. A minimum of 5 references for comparable work with client contact information shall be provided by bidders.

E. The Contractor's project manager shall have the authority to act on behalf of the Contractor with regards to all decisions that may be required to complete the terms and conditions of the contract.

F. Submittals shall include sufficient information pertaining to the qualifications of the Contractor's company and those of its subcontractors, certifications, experience, team member resumes, and other documentation of qualifications useful for the Town to understand the respondent Contractor's full capabilities.

G. The estimated start of work is the week of November 13, 2023 and completion date shall be no later than June 5, 2024. Substantial completion of the work shall be achieved by May 5, 2024.

GENERAL INFORMATION:

a) Each bidder is expected to carefully examine the project plans, specifications, and work site before preparing a project submittal. Information in the provided project specification, including Section 01010 General Requirements. The submission of a bid shall be deemed to be conclusive evidence that a bidder is aware of the scope of work and is satisfied with the conditions to be encountered in performing the work required. Bidders must satisfy for themselves as to the quantities of materials that will be necessary to remove and replace based upon inspection and measurement of the project site. No allowances will be made for loss of anticipated profits or unanticipated expenses due to any errors or inaccuracies in the estimated quantities or project expenses incurred by the contractor.

b) Questions about the project plans, details, or technical specifications may be submitted in writing to the Owner Representative Jeffrey Hyand of Ironwood Design Group (JHyland@FeWood.com) . The Town reserves the right to share written correspondence with all interested bidders and to issue addendums to these specifications as may be necessary.

c) The Town reserves the right to accept or reject any project bid submittals and to waive any minor bid defects as may be in the Town's best interest, and to request additional information from any bidder prior to issuing a notice of award or soliciting new project bid submittals.

d) The Town has hired Ironwood Design Group to provide construction administration services. Landscape Architect Jeffrey Hyland of Ironwood Design Group will serve as the Owner Representative (JHyland@FeWood.com).

e) The following factors will be considered as the basis for award of the project, to be determined solely by the Town:
    a) Price
    b) Compliance with Bid Form requirements
    c) Exclusions and limitations
    d) Qualifications and references

f) RSA 447:16 requires a contractor to post sufficient security, by bond or otherwise, for all repairs to public buildings in excess of $35,000. Therefore, the Town shall withhold all payments due to the Contractor, as security collateral, pending submission of a release by all suppliers and subcontractors used in carrying out the requirements of the project. In lieu thereof, the Contractor may provide the Town with a bond in the amount of 100% of the project cost provided the bond instrument and issuing agent is acceptable to the Town.

g) The Library shall provide the contractor with access to electrical power, water, and local permits (if applicable) at no charge.

h) Payment by the Town may allow payment of materials purchased and secured. Full payment to be made upon completed installation and acceptance by the Town, net 30 days after invoice. Project completion shall be defined as all materials being completely and permanently installed in accordance with the contract documents, including completion of a punch list, and the site being broom clean.

i) The Contractor shall provide, erect, and maintain all necessary construction fencing, signage, barricades, and other safety devices for the protection of the work, workers, and the public, with the understanding that the Mary E. Barlett Memorial Library will be open for business at all times during project construction. The work area shall be cleaned daily, or more frequently, if necessary, to prevent accidents to the greatest extent practical. The work area perimeter shall be secured at the end of each day and during periods of inactivity. The Contractor shall determine if the flood lighting on the building will provide sufficient security of stored equipment and materials during construction.

j) The following amounts and types of insurance coverage will be required to be in place for the Contractor and all subcontractors, with proof to be furnished prior to the execution of the project agreement. The Town of Brentwood shall be named as additional insured/certificate holder for each policy.
    - Comprehensive Liability - $1,000,000 each occ. $2,000,000 Aggregate
    - Automobile Liability - $1,000,000
    - Worker's Compensation – per NH law
    - Builder's Risk – 100% of contract value

k) The Contractor shall use every precautions to prevent injury or damage to Town property and private property in the vicinity of the project area, the Contractor shall be responsible for all damage and injury to persons and/or property during the execution of the work resulting from any act, omission, neglect, and/or misconduct in the manner or method of performing the work, to include the acts of any subcontractors and work done as part of any warranty service. The contractor shall indemnify, defend, and hold harmless the Town of Brentwood, its agents and assigns from any liability, damage, claims, penalties, and/or regulatory agency fines that may arise from the project and warranty work. The Contractor shall promptly restore to the satisfaction of the Town, at the Contractor's expense, any property that may be damaged during the execution of the work, including warranty work.

l) Any changes to the work that result in a cost increase/decrease shall be set forth in a written change order approved by the Owner Representative and the contractor prior to being implemented.

m) The Contractor will be responsible for all costs incurred by the Town, including legal and inspection fees, in the event that the contractor fails to perform the work in accordance with the project specifications. The Town reserves the right to use monies that may otherwise be due to the contractor, if necessary, to complete the work and/or repair defective work and/or pay any valid claims for damages or unpaid liens arising from the project.

n) The project completion deadline is June 5, 2024. Failure to complete the project on time will result in liquidated damages being assessed against the vendor in the amount of one-half of one percent (0.5%) of the total project costs for every day or portion thereof; unless the contract is extended by mutual written agreement of the parties.

CONTRACT AGREEMENT
Mary E. Bartlett Memorial Library – Amphitheater

THIS AGREEMENT made as of the ___day of _____ in the year _____, by and between the Town of Brentwood, New Hampshire (hereinafter call the Owner) and _____ (hereinafter called the Contractor), WITNESSETH; that the Owner and Contractor, in consideration of the mutual covenants hereinafter set forth, agree as follows:

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

ARTICLE II – PROJECT MANAGER – shall mean Owner's authorized Representative, will act in connection with completion of the Project in accordance with the Contract Documents.

ARTICLE III – CONTRACT TIME – The work will commence and finish in accordance with the schedule submitted with the Bid Form and accepted by the Owner.

ARTICLE IV – CONTRACT PRICE and PAYMENT – Upon final acceptance of the work and settlement of all claims, Owner shall pay the Contractor the Contract Price as shown in the Bid Form, subject to additions and deductions and retainage provided for in the Contract Documents.

ARTICLE V – RETAINAGE – To ensure the proper performance of this Contract, the Owner shall retain one hundred percent of the Contract Price as specified in the Contract Documents until proof of payment to all subcontractors and vendors is provided and the work is completed to the satisfaction of the Owner.

ARTICLE VI – LIQUIDATED DAMAGES – In the event the Contractor fails to successfully complete the work within the specified contract time the Owner shall assess the Contractor liquidated damages as specified in the Contract Documents. Liquidated damages shall be deducted from the Contract Price prior to final payment of the Contractor.

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

VII.1 Invitation to Bid
VII.2 Contractor's Completed Bid Form

VII.3 Notice of Award
VII.4 This Contract Agreement
VII.5 Project Plans and Technical Specifications
VII.6 Any change orders duly executed after the effective date of this agreement.

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

ARTICLE IX – INDEMNIFICATION OF OWNER – Contractor will indemnify Owner against all suits, claims, judgements, awards, loss, cost, or expense (including without limitation attorneys' fees) as otherwise set forth in the Contract Documents.

ARTICLE X – PERMITS – The Contractor will secure at its own expense, all non-local permits and consents required by law as necessary to perform the work and will give all notices and pay all fees and otherwise comply with all applicable State and Federal laws, ordinances, rules, and regulations. The fee for the Town of Brentwood Building Permit shall be waived.

ARTICLE XI – INSURANCE – The Contractor shall secure and maintain, until acceptance of the work, insurance with limits not less than those specified in the Contract Documents. A certificate of insurance shall be provided to the Owner Representative.

ARTICLE XII – MISCELLANEOUS

XII.1 Neither Owner nor Contractor shall, without the prior written consent of the other, assign, sublet or delegate, in whole or in part, any of its rights or obligations under any of the Contract Documents; and specifically, not assign any monies due, or to become due, without the prior written consent of Owner.

XII.2 Owner and Contractor each bind themselves, their partners, successors, assigns and legal representatives, to the other party hereto in respect to all covenants, agreements and obligations contained in the Contract Documents.

XII.3 The Contract Documents constitute the entire Agreement between Owner and Contractor and may only be altered, amended, or repealed by a duly executed written instrument.

XII.4 The laws of the State of New Hampshire shall govern this Contract without reference to the conflict of law principles thereof.

XII.5 Venue for any dispute shall be Rockingham County Superior Court unless the parties otherwise agree.

IN WITNESS WHEREOF, the parties hereunto executed this CONTRACT AGREEMENT the day and year first above written.

BIDDER:

BY: _____

TITLE: _____

TOWN OF BRENTWOOD, NH:

BY: _____

_____

_____

_____

_____

Brentwood Select Board

BID FORM

BIDDER: _____

PROJECT: Mary E. Bartlett Memorial Library - Amphitheater

OWNER: Town of Brentwood, New Hampshire

The undersigned, hereafter referred to as the BIDDER has examined the Contract Documents prepared in connection herewith by JVA/Emanuel Engineering and Ironwood Design Group. In addition, they have examined the site and is familiar with all the conditions surrounding the Work contemplated and hereby submits the following:

BIDDER agrees to perform all the work described in the CONTRACT DOCUMENTS for the following unit prices or lump sums:

PART I - BID FORM

NO.	ITEM	Unit	EST QTY	LUMP SUM OR UNIT PRICE (WORDS)	LUMP SUM OR UNIT PRICE (FIGURES)	TOTAL PRICE (FIGURES)
1.	General Conditions	L.S.	1	_____ _____Dollars and _____ cents lump sum.	$_____	$_____
2.	Traffic / Pedestrian Management and Perimeter Safety	L.S.	1	_____ _____Dollars and _____ cents lump sum.	$_____	$_____
3.	Demolition & Site Preparation	L.S.	1	_____ _____Dollars and _____ cents lump sum.	$_____	$_____
4.	General Site Work & Erosion Control	L.S.	1	_____ _____Dollars and _____ cents lump sum.	$_____	$_____
5.	Storm Water Management System	L.S.	1	_____ _____Dollars and _____ cents lump sum.	$_____	$_____

NO.	ITEM	Unit	EST QTY	LUMP SUM OR UNIT PRICE (WORDS)	LUMP SUM OR UNIT PRICE (FIGURES)	TOTAL PRICE (FIGURES)
6.	Concrete Block Wall with Cap	L.S.	1	_____ _____Dollars and _____ cents lump sum.	$_____	$_____
7.	Vertical Granite Curb (straight and radius)	L.F.	290	_____ _____Dollars and _____ cents per linear foot.	$_____	$_____
8.	Flush Granite Curb (straight and radius)	L.F.	74	_____ _____Dollars and _____ cents per linear foot.	$_____	$_____
9.	Sloped Granite Curb	L.F.	210	_____ _____Dollars and _____ cents per linear foot.	$_____	$_____
10.	Concrete Sidewalk	S.Y.	174	_____ _____Dollars and _____ cents per square yard.	$_____	$_____
11.	Tactile Warning	L.S.	1	_____ _____Dollars and _____ cents lump sum.	$_____	$_____
12.	4” Bituminous Pavement	Ton	286	_____ _____Dollars and _____ cents per ton.	$_____	$_____
13.	Pavement Striping	L.S.	1	_____ _____Dollars and _____ cents lump sum.	$_____	$_____

NO.	ITEM	Unit	EST QTY	LUMP SUM OR UNIT PRICE (WORDS)	LUMP SUM OR UNIT PRICE (FIGURES)	TOTAL PRICE (FIGURES)
14.	Porous Concrete Pavers	S.F.	1115	_____ _____Dollars and _____ cents per square foot.	$_____	$_____
15.	Concrete Pavers (bituminous base)	S.F.	690	_____ _____Dollars and _____ cents square foot.	$_____	$_____
16.	Concrete Pavers (gravel base)	S.F.	683	_____ _____Dollars and _____ cents lump sum.	$_____	$_____
17.	Electrical Pannel Connection, Photo Control, Conduit, Footings	L.S.	1	_____ _____Dollars and _____ cents lump sum.	$_____	$_____
18.	Illuminated Bollard	Ea.	7	_____ _____Dollars and _____ cents each.	$_____	$_____
19.	Non-Illuminated Bollard	Ea.	3	_____ _____Dollars and _____ cents each.	$_____	$_____
20.	Place Stockpiled Boulder	Ea.	11	_____ _____Dollars and _____ cents each.	$_____	$_____
21.	Relocate Shed	L.S.	1	_____ _____Dollars and _____ cents lump sum.	$_____	$_____

NO.	ITEM	Unit	EST QTY	LUMP SUM OR UNIT PRICE (WORDS)	LUMP SUM OR UNIT PRICE (FIGURES)	TOTAL PRICE (FIGURES)
22.	Re Install Salvaged Items (lending library and mailbox)	L.S.	1	_____ _____Dollars and _____ cents lump sum.	$_____	$_____
23.	Shade Tree	Ea.	7	_____ _____Dollars and _____ cents each.	$_____	$_____
24.	Flowering Tree	Ea.	2	_____ _____Dollars and _____ cents each.	$_____	$_____
25.	Shrub Plantings	L.S.	1	_____ _____Dollars and _____ cents lump sum.	$_____	$_____
26.	Ground Cover Plantings	L.S.	1	_____ _____Dollars and _____ cents lump sum.	$_____	$_____
27.	Bioretention Area (Rain Gardens)	LS	1	_____ _____Dollars and _____ cents lump sum.	$_____	$_____

Total price of items to be provided on Bid Form page 5

(End Part 1)

PART II – BID ALTERNATES

The Owner, in making a bid award, may exercise any, all, or none of the Bid Alternate(s) which the Owner, in its sole judgment, determines to be in its best interests. The Bidder is required to provide a bid price for each Alternate listed below. If selected by Owner, the Alternate(s) will be added to the Base Bid price for Part I. The totals identified below shall be inclusive of all materials, labor and incidentals for a complete in place price.

NO.	ITEM	Unit	EST QTY	LUMP SUM OR UNIT PRICE (WORDS)	LUMP SUM OR UNIT PRICE (FIGURES)	TOTAL PRICE (FIGURES)
A-1	Double Wide Bench at the Library Entrance Plaza	EA	1	_____ _____Dollars and _____ cents each.	$_____	$_____
A-2	Trash Receptacle	EA	1	_____ _____Dollars and _____ cents each.	$_____	$_____
A-3.	Black Vinyl Chain Link Fence	LS	1	_____ _____Dollars and _____ cents per lump sum.	$_____	$_____
A-4	Dumpster Enclosure with Two Dumpster Bollards	LS	1	_____ _____Dollars and _____ cents per lump sum.	$_____	$_____
A-5	Two Area Lights (poles, luminaires, conductors and connections)	LS	1	_____ _____Dollars and _____ cents per lump sum.	$_____	$_____
A-6	Existing timber wall removed and area regraded	LS	1	_____ _____Dollars and _____ cents per lump sum.	$_____	$_____

Total Price: Sum of Part Bid Form I (Items 1 through 27) and Part II Bid Alternates (A-1 through A-6)

(Figures) _____

(Written) _____

dollars and _____ cents

The Bidder agrees to **add** or **deduct** work required by the Owner for the above-mentioned prices (as applicable).

The undersigned, as Contractor declares as follows:

(1) The only parties interested in the BID as Principals are named herein;

(2) This BID is made without collusion with any other person, firm, or corporation;

(3) The Bidder has carefully examined the site of the proposed work and is fully informed and is satisfied as to the conditions there existing, the character and requirements of the proposed Work, and the difficulties attendant upon its execution. The Bidder has carefully read and examined the Drawings, the proposed CONTRACT AGREEMENT and the Specifications and other Contract Documents therein referred to and knows and understands the terms and provisions thereof;

(4) The Bidder understands the information relative to subsurface and other conditions, natural phenomena, existing pipes and other structures (surface and/or subsurface) has been furnished only for their information and convenience without any warranty or guarantee, expressed or implied, that the subsurface and/or other conditions, natural phenomena, existing pipes and other structures (surface or subsurface) actually encountered will be the same as those shown on the Drawings or in any other Contract Documents and he agrees that he shall not use or be entitled to use such information made available to them through the Contract Documents or otherwise obtained by their own examination of the site, as a basis of or ground for any claim against the Owner, Engineer, or Landscape Architect arising from or by reasons of any variance which may exist between the aforesaid information made available to, or otherwise obtained by them and the subsurface and/or other conditions, natural phenomena, existing pipes and other structures (surface and/or subsurface) actually encountered during the construction work, and they have made due allowance therefore in the BID;

(5) They understand that all reports of investigations and tests of subsurface physical conditions at the site and other information affecting the performance of the Work which have been relied upon by the Engineer and Landscape Architect in preparation of the Drawings and Specifications are not guaranteed as to accuracy or completeness and are not part of the Contract Documents.

(6) And they understand that the quantities of work tabulated in this Proposal and indicated on the Drawings and in the Specifications and other Contract Documents are approximate and are subject to increase or decrease as deemed necessary, and as allowed for under the Contract Documents.

The undersigned agrees that for extra work, if any, authorized in writing by the Owner Representative to be performed by them in accordance with the terms and provisions of the CONTRACT AGREEMENT, they will accept compensation as stipulated in the Contract Documents in full payment for such extra work, and agrees that for reductions in work as directed by the Owner Representative, they will accept reduced compensation as stipulated in the Contract Documents.

If this Bid Form is accepted by the Owner, the undersigned agrees to substantially complete the work in accordance with the schedule for substantial completion of work per the Special Conditions, provided to be done under the Contract, and accepts the provisions of the CONTRACT AGREEMENT as to liquidated damages in the event of failure to complete any element of the work on time, except as otherwise expressly provided in the CONTRACT AGREEMENT.

The Bidder hereby agrees that, once opened, he will not withdraw this BID within 30 days of BID opening, and that if the Owner shall accept this BID, the Bidder will duly execute the Contract and provide BONDS required.

PART III -ADDITIONAL INFORMATION

Subcontractors
For the trades listed below (if applicable), the undersigned intends to use the Subcontractor whose name appears opposite letter 'a' under each trade. If so requested by the Owner or the Owner Representative, prior to awarding of the General Contract, the undersigned will substitute any Subcontractor whose name appears opposite letter 'b' or letter 'c' under any trade, on condition that the base bid stated above will be adjusted by the difference between the amount of the sub-bid carried in the base bid and the sub-bid to be substituted.

1. Masonry / Concrete

   a. Name: _____ $ _____

   b. Name: _____ $ _____

   c. Name: _____ $ _____

2. Bituminous Pavement

   a. Name: _____ $ _____

   b. Name: _____ $ _____

   c. Name: _____ $ _____

3. Curbing

   a. Name: _____ $ _____

   b. Name: _____ $ _____

   c. Name: _____ $ _____

4. Landscape

   a. Name: _____ $ _____

   b. Name: _____ $ _____

   c. Name: _____ $ _____

5. Fencing

   a. Name: _____ $ _____

   b. Name: _____ $ _____

   c. Name: _____ $ _____

6. Hardscape

a. Name: _____ $ _____

b. Name: _____ $ _____

c. Name: _____ $ _____

8. Lighting/Electrical

a. Name: _____ $ _____

b. Name: _____ $ _____

c. Name: _____ $ _____

Long Lead Items
Where the Contractor expects an item's bid to require special attention because of required long lead time ordering to assure timely delivery, notice shall be made of the item on the Bid Form.

Execution of Contract
The undersigned will, within seven (7) working days following execution of the CONTRACT AGREEMENT will commence work on the project unless otherwise instructed or agreed upon.

Completion of Work
The work will be fully completed by June 5, 2024. The undersigned hereby designates as their office to which such notice of acceptance may be mailed or delivered:

Remarks by Bidder

_____

_____

_____

_____

Respectfully Submitted:

_____Company Name

By:_____ _____
Name (Printed) Address

_____ _____
Title Address

_____ _____
Signature Date

(SEAL if Proposal is by a Corporation)

_____
Attest

ADDENDA

The BIDDER acknowledges receipt of the following Addenda* (if applicable).

No. _____ Dated

No. _____ Dated

No. _____ Dated

No. _____ Dated

No. _____ Dated

No. _____ Dated

** to be filled in as appropriate*

Mary E. Bartlett Memorial Library

Amphitheater Improvement Project

22 Dalton Road
Brentwood, New Hampshire

TECHNICAL SPECIFICATIONS

October 2, 2023

Prepared by

Ironwood Design Group, LLC
Landscape Architects
PO Box 873
Exeter, NH 03833
603.772.0590

List of Technical Specifications

Section 01 01 0 General Requirements

Section 26 56 00 Exterior Lighting

Section 31 20 00 Earthwork

Section 32 13 13 Concrete Paving

Section 32 14 00 Unit Paving

Section 32 31 13 Chaing Link Fence

Section 32 32 00 Concrete Block Wall

Section 32 33 00 Site Furnishings

Section 32 39 13 Manufactured Metal Bollards

Section 32 91 00 Planting Soils

Section 32 92 00 Turf and Grasses

Section 32 93 00 Planting

SECTION 01010 GENERAL REQUIREMENTS

1.01 TIME OF THE COMPLETION OF THE WORK

A. The work which the Contractor is required to perform under this Contract shall be commenced at the time stipulated by the Owner and shall be fully completed within the time stipulated except as the work may be interrupted by weather conditions and hereinafter specified. The Contractor shall employ sufficient equipment and workmen to complete the installation as expeditiously as possible as directed by the Owner. If, in the opinion of the Owner, the progress of the work of the Contractor does not, at any time, clearly demonstrate that the completion of the installation will meet with the approval of the Owner, the Owner reserves the right to require the Contractor to employ such additional equipment and workmen as required, all without additional cost to the Owner.

B. The Owner shall determine when the work shall be interrupted due to unsatisfactory weather conditions. Determination of the period to be included in the Time of Completion shall cease when the Owner directs that the work stop due to the weather and shall commence again on the first working day thereafter that the Owner may designate for the work to be resumed.

C. The Contractor shall cooperate with Boston Edison and the City of Boston Department of Public Works and shall schedule his demolition, construction and deliveries so that all work shall be complete and ready for the Owner's use no later than the date stipulated in the signed Contract with the Owner.

1.02 RESPONSIBILITIES OF THE CONTRACTOR

A. The Contractor shall be responsible for all work on site during the life of the project and shall have a duly authorized representative on site continuously supervising and directing all activities, including but not limited to preparation for construction, receiving of materials and all other work associated with completing the project.

B. The Contractor shall be responsible for continuously supervising and directing all employees of the Contractor, all tiers of Subcontractors, all persons involved in supplying or delivering materials to the site all persons involved in any other activities on the site.

C. Safety of all persons and equipment is the responsibility of the Contractor, and he shall continuously supervise and direct the work so that it is accomplished so as to preclude injury to persons or damage to equipment.

D. Except as otherwise specifically stated in the Contract Document and the Technical Specifications, the Contractor shall provide and pay for all materials, tools, labor, equipment, water, light, heat, power, transportation, superintendence, temporary construction of every nature, charges, levies, fees or other expenses, permits and back charges and all other services and facilities of every nature whatsoever necessary for the performance of the Contract and to deliver all improvements embraced in this Contract completed in every respect within the specified time.

E. Unless otherwise specified herein all materials, workmanship, methods, and practices shall conform to the current standards of the appropriate governing agency and/or the Owner's standards.

F. The Contractor shall be responsible for detailed layout, all stake-out and grade control, and shall employ a registered Professional Engineer or a registered Land Surveyor for these purposes.

G. The Contractor shall verify dimensions and utility locations on the plans and if any inconsistencies or discrepancies between the Drawings and actual field conditions or between the Drawings and Specifications. The Contractor shall immediately notify the Owner of any inconsistencies. The Contractor will be held responsible for any errors resulting from his failure to exercise the aforementioned precaution. Such information shall be marked on the copies of the Drawings and submitted to the Owner and incorporated into the As-built Record Drawings.

H. As soon as the Contract is executed, the Contractor shall order materials, submit construction schedules as hereinafter specified. The work of construction shall begin at the time stipulated by the Owner and shall be completed within the Time of Completion specified.

I. It is the Contractor's responsibility to make his own investigation and to satisfy himself as to subsurface conditions and to insure that these are reflected in his bid.

J. In order to verify locations of utilities and varying field conditions exploratory excavations are necessary. The cost of explorations shall be included in the contract price bid.

K. If it becomes necessary for the Contractor to obtain permits the cost of all permits shall be included in the contract price bid.

L. The Contractor shall fully inform himself of existing conditions of the site before submitting his bid, and shall be fully responsible for carrying out all work required to fully and properly execute the work of the Contract, regardless of the conditions encountered in the actual work. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed, except those conditions described under the GENERAL CONDITIONS.

M. The Contractor shall be responsible for the location, sealing, disconnection and/or protection of all existing utilities such as water, gas, sewers, steam, electricity and telephone in accordance with the regulations of the utility concerned.

N. The Contractor shall be solely responsible for judging the full extent of work requirements involved, including but not limited to the potential need for storing materials temporarily and/or rehandling items prior to final installation.

O. The Contractor shall verify all utility conditions and elevations prior to work. Before construction starts, all utility companies, public and private, must be contacted, including those in control of utilities not shown on this plan. See Chapter 370 Acts of 1963 Massachusetts and contact "DIG SAFE" 1-800-322-4844. Report any discrepancies in writing to the Landscape Architect and the Owner and receive written instructions prior to proceeding.

1.03 MANNER OF CONDUCTING THE WORK

A. The work shall be conducted with prime consideration given to the following:

1. Compliance with Americans with Disabilities Act requirements.
2. Compliance with governing laws and building codes.
3. Safety, protection, and convenience of the public and workmen.

4. Protection of the existing building structure, materials and finishes to remain from damage.
5. Minimization of dirt and dust proliferation.
6. Avoidance of any damage to existing vegetation to remain.

B. All work shall be done in accordance with the governing laws and building codes and all necessary permits required for the Site Preparation work shall be procured by the Contractor. Provide unobstructed legal exits at all times.

1.04 DEBRIS AND SURPLUS MATERIAL

A. All debris and waste material, scrap or salvageable material generated by the work and which is, in the opinion of the Landscape Architect and Owner, unsuitable for construction shall be removed from the property by the Contractor daily and disposed of in accordance with federal, state and local regulations. All bituminous pavement, PCC pavement, concrete structures and pipe shall be considered unsuitable. Debris shall not be permitted to accumulate and the work shall be kept satisfactorily clean at all times.

1.05 TEMPORARY FACILITIES

A. General Provisions:

1. Furnish all labor, materials and services to fulfill the requirements for temporary facilities, at no additional cost to the Owner, and comply with all requirements set forth herein, except where said requirements are in conflict with federal, state or local laws, rules and regulations, in which case(s) the applicable federal, state or local requirements shall govern.

B. Temporary Light and Power:

1. Make all necessary arrangements with the local electrical company, and pay all costs including labor, in operating and maintaining all temporary services for electricity used during the construction, unless specifically noted otherwise.

2. Ensure that temporary wiring, outlets, and lighting are provided in accordance with the requirements of Bulletin No. 12, Division of Industrial Safety, Department of Public Safety, Commonwealth of Massachusetts.

C. Contractor shall repair the site as required to return the disturbed areas to a condition equal to their original condition if the locations are not part of the proposed site improvements under this Contract.

1.06 RECORD DRAWINGS

A. The Contractor shall cooperate with the Landscape Architect and Owner and shall prepare and maintain a set of drawings on which shall be recorded accurately, as the work progresses, the actual "as-built" locations and dimensions of all his work, including thereon all variations from the Contract Drawings. This record of "as-built" conditions shall include the work of all subcontractors and shall be submitted, upon final acceptance of all work, to the Owner.

B. Prior to final acceptance of the work, all "as built" data shall be transferred by the Contractor to a complete set of reproducible record drawings in ink or photolitho reproductions on mylar (4 mm), furnished by the Owner. This work shall be performed by the Contractor's Registered Land Surveyor with the cooperation of the Contractor as

required. After review and approval by the Owner the "Record As-built Drawings" will be completed and delivered to the Owner.

1.07 SHOP DRAWINGS, PRODUCT LITERATURE AND SAMPLES

A. Shop drawings shall include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:

1. Dimensions.
2. Identification of products and materials included.
3. Compliance with specified standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurement.
6. Sheet Size: Except for templates, patterns and similar full-size drawings, submit shop drawings on sheets at least 8-1/2" x 11" but no larger than 36" x 48".
7. Submit one correctable translucent reproducible print and four blue- or blackline prints for the Landscape Architect's review.
8. Submit two prints where required for maintenance manuals.
9. Do not use shop drawings without an appropriate final stamp indicating action taken in connection with construction.
10. Coordination drawings are a special type of shop drawing that shows the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or function as intended.
11. Coordination drawings may include components previously shown in detail on shop drawings or product data.
12. Submit coordination drawings for integration of different construction elements. Show sequences and relationships of separate components to avoid conflicts in use of space.

B. Product Literature:

1. Collect product literature into a single submittal for each element of construction or system. Product literature includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where product literature must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings" Submit four copies of all product literature.

a. Mark each copy to show applicable choices and options. Where printed product data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:

1) Manufacturer's printed recommendations.
2) Compliance with recognized trade association standards
3) Compliance with recognized testing agency standards.
4) Application of testing agency labels and seals.
5) Notation of dimensions verified by field measurement.
6) Notation of coordination requirements.

b. Do not submit product literature until compliance with requirements of the Contract Documents has been confirmed.

C. Submit full size, fully fabricated samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets and swatches showing color, texture and pattern.

1. Mount, display or package samples in the manner specified to facilitate review of qualities indicated. Prepare samples to include the following:

a. General description of the sample.
b. Sample source.
c. Product name or name of manufacturer.
d. Compliance with recognized standards.
e. Availability and delivery time.

2. Submit samples for review of kind, color, pattern and texture, for a final check of these characteristics with other elements and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

a. Where variation in color, pattern, texture or other characteristics is inherent in the material or product represented, submit multiple units (not less than three unless otherwise specified in a specific section of the specification) that show approximate limits of the variations.
b. Refer to other Specification Sections for requirements for samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.
c. Refer to other Sections for samples to be returned to the Contractor for incorporation into the work. Such samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of sample submittals.

D. The Contractor shall be responsible for the prompt submission of all shop drawings, product literature and samples so that there will be no delay in the work.

E. In the instance of any discrepancies between the drawings and the actual dimensions or size of materials, the Contractor shall be responsible to make any and all adjustments necessary to install the materials as set forth in the Contract Documents.

F. The approval of shop drawings will be general and shall not relieve the Contractor from the responsibility for details of design, dimensions, etc., necessary for proper fittings and construction of the work as required by the Contract and to ensure the safety of the public.

1.08 PROVISIONS OF TRAFFIC

A. The Contractor shall not close or obstruct any portion of a street without obtaining permits therefor from the proper municipal authorities and with the knowledge of the Owner. If any street or private way shall be rendered unsafe by the Contractor's operations he shall make such repairs or provide such temporary ways or guards as shall be acceptable to the Owner.

B. Streets, roads, private ways and walks shall be maintained passable by the Contractor at his expense, and the Contractor shall assume full responsibility for the adequacy and

safety of provisions made. He shall conduct his construction operations such that interference with the flow of vehicular and pedestrian traffic shall be held to a minimum.

C. The Contractor shall cooperate in every way possible with the municipal authorities maintaining a flow of traffic through the site. The Contractor shall notify the Owner and the City of Boston Fire Department and Police Department when any street is to be closed regardless of the length of time or time of day.

D. All detours for both vehicular and pedestrian movement shall be signed and lighted as directed by the Owner and/or the City of Boston.

1.09 SITE INSPECTION

A. It shall be contingent upon the Contractor to inspect the site as an aid to determining the extent of his work under the various contract items prior to submission of his bid.

1.10 PROTECTION OF EXISTING STRUCTURES

A. All existing walks, pipes, conduits, poles, curbing, walls, buildings, trees and other structures and items which are to remain in place shall be carefully supported and protected from injury by the Contractor without additional compensation and in case of injury they shall be restored by him without compensation therefor to as good condition as that in which they were found.

B. The Contractor shall, at his own expense, provide suitable and safe bridges and other crossings, where required for accommodation of travel and to provide access to private property during construction and shall remove said structures thereafter without additional cost to the Owner.

C. Utility lines shown are located from the best information available. Services may not be shown. The existence of utilities which are normally located in the streets or on the site and not shown on the plans shall not be considered as an unusual obstacle, and the Contractor shall not be entitled to extra compensation for maintaining, protecting, or restoring utilities which he disturbs.

1.11 VALIDITY OF DOCUMENTS

A. If any part of the Contract Documents, or the application of the same to any situation, shall to any extent be invalidated or contrary to the law, the remainder of such documents and the application to the other situations or any provisions found invalid as to any given situation, shall not be affected thereby.

1.12 WATER AND PUMPING

A. The Contractor shall at all times protect the excavation, trenches and existing or adjacent buildings from damages from rain water, spring water, ground water, backing up of drains and sewer, and from all other water.

B. All excavated portions shall be maintained free from water at all times, no matter what the sources, by means of temporary pumping equipment.

C. Contractor shall provide all necessary pumps, drains and well points for removing water from trenches, footings and other parts of the work.

1.13 EMERGENCIES

A. The Contractor shall furnish to the Owner, in writing, with a copy to the Landscape Architect, the names, addresses and telephone numbers of the members of his or his Principal Subcontractor's organizations to be contacted in the event of an emergency at the construction site.

- END OF SECTION -

SECTION 26 56 00 – EXTERIOR LIGHTING

PART I – GENERAL

1.1 DESCRIPTION

A. This section specifies the furnishing, installation, and connection of exterior fixtures, poles, and supports. The terms “lighting fixtures”, “fixture” and “luminaire” are used interchangeably.

1.2 REFERENCES

A. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section.
B. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.3 SCOPE

A. The work of this Section consists of all Site Improvement work and related items as indicated on the Drawings and/or specified herein and includes, but is not limited to, the following:

1. Lighting Poles and Standards
2. LED Exterior Lighting

1.4 RELATED WORK

A. Examine all Drawings and all other Sections of the Specifications for requirements affecting the work described below.

1.5 QUALITY ASSURANCE

A. Quality Assurance shall be in accordance with Section 26 05 11, Requirements For Electrical Installations.

1.6 SUBMITTALS

A. Submit in accordance with Section 26 05 11, Requirements for Electrical Installations, and the following requirements:
   1. Shop Drawings:
      a. Submit the following information for each type of lighting fixture designated on the lighting and site plans.
      b. Material and construction details, include information on housing and optics system.
      c. Physical dimensions and description.
      d. Wiring schematic and connection diagram.
      e. Installation details.
      f. Energy efficiency data.
      g. Photometric data based on laboratory tests complying with IES Lighting Measurements testing and calculation guides.
   2. Manuals:
      a. Submit, simultaneously with the shop drawings, complete maintenance and operating manuals, including technical data sheets, wiring diagrams, and information for ordering replacement parts.
      b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.

1.7 PRODUCT HANDLING AND STORAGE

A. Provide manufacturer's standard provisions for protecting pole finishes during transport, storage, and installation. Do not remove factory-applied pole wrappings until just before installing pole.
B. Deliver exterior lighting fixtures individually wrapped in factory-fabricated fiberboard type containers.
C. Handle exterior lighting fixtures carefully to prevent breakage, denting and scoring the fixture finish.
D. Do not install damaged lighting fixtures.
E. Store exterior lighting fixtures in a clean, dry space and protect from the weather.
F. Do not store poles on ground; they should remain in their shipping containers and kept on shipping pallets.

1.8 STANDARDS

A. Except as modified by governing codes and by the Contract Documents, comply with applicable provisions and recommendations of the following:
    a. AASHTO: American Association of State Highway and Transportation Officials, latest edition.
    b. American Concrete Institute (ACI)
    c. American National Standards Institute (ANSI)
    d. American Society for Testing and Materials (ASTM)
    e. Illuminating Engineering Society of North America (IESNA)
    f. National Electrical Manufacturers Association (NEMA)
    g. National Fire Protection Association (NFPA)

1.9 QUALIFICATIONS

A. The electrical work shall be performed by a Contractor or Subcontractor with a minimum of (5) five years of acceptable experience in the installation of materials specified herein on projects comparable to this project and under the supervision of a qualified foreman with a minimum of five (5) years of experience.

1.10 ACCESSIBILITY CODES

A. From time to time there are changes made in the federal and /or state accessibility and /or building codes or it is determined that different codes are applicable to a site. Such determinations or changes may occur during the course of the construction of this project. If changes become necessary to meet codes a change order shall be issued by the Owner to cover statutory requirements.
B. Materials and installation shall be in accordance with the latest revision of the National Electrical Code and any applicable federal, state, and local codes and regulations.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Luminaires, materials, and equipment shall be in accordance with NEC, UL, ANSI, and as shown on the drawings and specified.
B. The contractor shall use all new materials of high quality. The contractor shall submit product specifications for approval.
C. Provide lighting fixtures, of the size, type and rating indicated on the Lighting Fixture Schedule, complete with, but not necessarily limited to, lamps, lamp holders, reflectors, diffusers, louvers, wire guards, tube guards, ballasts, fuses, starters, and wiring. Fixtures shall be furnished with all

required accessories and trim, including hold-down clips, as required for a complete installation in the ceiling-type shown on the Architectural Drawings.

2.2 AREA LIGHT

A. LED Amall Area Light
Lumecon Detroit Series, Catalog number: LDS-SAL-80-BK-T3-1-30-MAS
Or approved equal.

Wattage	80 watts
Color	Black
Distribution	T3 type III
Color temperature	30 – 3,000K
Mounting methods	MAS – mounting arm square pole

MANUFACTURER

Lumecon
23107 Commerce Dr.
Farmington Hills, MI 48335
https://lumecon.com/categories/

Local lighting salesperson, Peter Beane peter@speclines.net.

B. Light Pole
Square Straight Steel Pole from Hapco
Or approved equal.

Pole Style	Steel Straight Square Pole
Pole Height	20’
Base Style	4-Bolt Steel Plate Base Flange of fabricated hot rolled carbon steel conforming to ASTM A36 or equivalent (36 ksi minimum yield) with 2-piece Base Cover and attaching hardware.
Pole Base Cover	Square ABS plastic Base Covers are standard on all SSS poles specified in BA-Black.
Material	Pole shaft shall be weldable-grade, cold-rolled, commercial quality carbon steel tubing conforming to ASTM A500 Grade B. Options include 11 gauge and 7 gauge. All welds shall conform to AWS D1.1 using ER70S-6 electrodes.
Finish	Powder coated painted black
Access Door	Reinforced, 3" x 5" Handhole with cover, stainless steel screw and backbar. A grounding provision incorporating a tapped 1/2"-13NC hole will be provided.
Pole Diameter	5’ butt square no taper
Anchor Bolts:	4 bolt base
Catalog No	SSS 20 D 5-4- BA

MANUFACTURER

Hapco
26252 Hillman Hwy,
Abingdon, VA 24210
www.hapco.com

Local lighting salesperson, Peter Beane peter@speclines.net.

C. Installed poles and lights shall be free of leaks, warps, dents, juts, paint imperfections or other faults that are a result of poor workmanship in installation.

2.3 CONSTRUCTION REQUIREMENTS

A. Contractor shall perform all work to be in conformance with local and national code requirements.
B. Before installing any of the work, the Contractor shall see that it does not interfere with the existing or proposed underground utilities or other fixed elements. Work installed by the Contractor which interferes with or modifies the design as shown on the Contract Drawings shall be changed as directed by the Owner's Representative, and all costs incidental to such changes shall be paid by the Contractor.
C. In any and all cases of discrepancy in figures, plans or specifications the matter shall be immediately submitted to the Owner's Representative for decision.
D. Bases, poles and luminaries shall be installed in accordance with the manufacturers' recommendation and the construction drawings.

PART 3 – EXECUTION

3.1 PREPARATION

A. Install lighting in accordance with the NEC, as shown on the drawings, and in accordance with manufacturer's recommendations.

B. Adjust luminaires that require field adjustment or aiming.

C. Verify operation after installing poles, luminaires, and energizing circuits.

3.2 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.

C. Examine walls, roofs, canopy ceilings and overhang ceilings for suitable conditions where luminaires will be installed.

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

3.3 INSTALLATION

A. Install lamps in each luminaire.

B. Fasten luminaire to indicated structural supports. Additional support requirements include:

C. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

1. Support: Attached to structural members in walls.

2. Wiring Method: Install cables in raceways. Conceal raceways and cables.

3. Install luminaires level, plumb, and square with finished grade unless otherwise indicated. Install luminaires at height and aiming angle as indicated on Drawings.

4. Coordinate layout and installation of luminaires with other construction.

5. Retain subparagraph below if seismic restraint is required by local code or authorities having jurisdiction.

6. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

3.4 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways" In concrete foundations, wrap conduit with thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.5 FINISHING

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Luminaire will be considered defective if it does not pass tests and inspections.

C. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION

SECTION 31 20 00 - EARTH MOVING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes: Provide labor, materials and equipment necessary to complete the work of this Section, including:
   1. Removal of subsoil, excavating and trenching
   2. Backfilling
   3. Cutting, grading, filling, rough contouring, and compacting site for utility, road, parking, sidewalks, walkways and landscape installation

B. Related Sections:
   1. Section 32 91 00 – Planting Soils
   2. Section 32 92 00 – Turfs and Grasses
   3. Section 32 93 00 – Planting

1.2 REFERENCES

A. Local utility standards when working within 24 inches of utility lines.

B. Standard Specifications: State of New Hampshire, Department of Transportation, Standard Specifications for Highways and Bridges, latest edition.

C. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

D. ASTM International:
   1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
   2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft3 (600 kN-m/m3)).
   3. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
   4. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
   6. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
   7. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head).
   8. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
   9. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   10. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 DEFINITIONS

A. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions on Drawings or without approval by Engineer.

B. Landscaped Areas: Areas not covered by structures, walks, roads, paving, or parking.

C. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

D. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

E. Utility: Any buried pipe, duct, conduit, or cable.

1.4 SUBMITTALS

A. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.

B. Shop Drawings: Indicate soil densification grid for each size and configuration footing requiring soils densification.

C. Product Data: For the following:
1. Each type of plastic warning tape

D. Samples: Submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory.

E. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
2. Laboratory compaction curve according to ASTM D 1557 for each onsite and borrow soil material proposed for fill and backfill.

F. Materials Source: Submit name of imported materials source.

G. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.6 QUALITY ASSURANCE

A. Furnish each topsoil material from single source throughout the Work.

B. Perform work in accordance with ASTM C136, ASTM D2419, and ASTM D2434.

C. Perform work in accordance with NHDOT Standard Specifications (Latest Edition).

D. Perform work in accordance with applicable permit conditions and regulatory requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Requirements:
   1. Excavation: When temperatures below 32 degrees F are anticipated, do not excavate to final required elevations for concrete work unless concrete can be placed immediately.
   2. Backfilling: When backfilling below 32 degrees F, the following procedures must be followed:
      a. Remove frozen ground in its entirety from beneath and five feet beyond the area of fill placement.
      b. Fill material to consist of selected fill free of all frozen chunks that exceed four inches in size. Material transported to the project site must only consist of material excavated from below the frost depth.
      c. End of the work day: Cover the area of fill placement with insulated blankets. Other means of protection (straw, wood chips, etc.) may also be used for protection provided it is approved by the Engineer.
      d. Following work day: Remove the insulated blankets and/or strip the area of all frozen material as specified previously.
      e. Upon establishing the subgrade elevations, protect the grades with insulated blankets or place additional material that will adequately insulate the ex-posed earth surface from frost. Strip additional or protective material just prior to pouring concrete.

1.8 QUALIFICATIONS

A. Prepare excavation protection plan under supervision of Professional Engineer experienced in design of this Work and licensed in the State of New Hampshire.

PART 2 PRODUCTS

2.1 GEOTEXTILE DELINEATION FABRIC (REMEDIATION CAP FABRIC)

A. Geotextile delineation fabric shall consist of an orange delineation non-woven geotextile such as Mirafi 160NO or approved equivalent.

2.2 COMMON FILL/ORDINARY BORROW

A. Common Fill/Ordinary Borrow shall be friable soil containing no stone greater than two-thirds (2/3) the loose lift thickness with a maximum stone size of twelve (12) inches in diameter. The material shall be essentially free of trash, ice snow, tree

stumps, roots, and organic materials. The soil shall contain no more than 25 percent passing the #200 sieve.

PART 3 EXECUTION

3.1 EXCAVATION EXAMINATION

A. Verify survey benchmark and intended elevations for the Work as indicated on Drawings

B. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

3.2 EXCAVATION PREPARATION

A. Dig Safe at 1-888-DIG-SAFE (1-888-344-7233) not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Prior to altering any utilities, obtain consent of utility service provider.
   1. Arrange with the utility service providers to shut off utilities to be disturbed as indicated on the Drawings and inform Owner and Engineer of anticipated interruption.

C. Identify required lines, levels, contours, and datum.

D. Notify utility company to remove and relocate utilities.

E. Establish temporary traffic control when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.3 PROTECTION

A. Maintain and protect above and below grade utilities indicated to remain.

B. Protect plant life, lawns, rock outcroppings and other features remaining as portion of final landscaping.

C. Protect benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

D. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.

E. Grade excavation top perimeter to prevent surface water run-off into excavation or to adjacent properties.

F. Prevent displacement or loose soil from falling into excavation; maintain soil stability.

G. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

H. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

I. Protect newly graded areas from traffic, freezing, erosion and over compaction.

3.4 UNDERGROUND UTILITIES

A. Do not interrupt existing utilities that are in service until temporary or new utilities are installed and operational.

B. Abandoned utilities:
1. Remove abandoned utilities beneath, and five feet laterally beyond, the structure's proposed footprint. Backfill and compact excavations required for their removal.
2. Utilities extending outside the five feet limit specified above may be abandoned in place provided their ends are adequately plugged as described below.
3. Permanently close open ends of abandoned underground utilities, exposed by ex-cavations, which extend outside the limits of the area to be excavated.
4. Close open ends of metallic conduit and pipe with threaded galvanized metal caps or plastic plugs or other approved method for the type of material and size of pipe. Do not use wood plugs.
5. Close open ends of concrete and masonry utilities with concrete or flowable fill.

3.5 GENERAL EXCAVATION

A. Excavate subsoil to accommodate utilities, roads, parking, sidewalks, walkways, landscape installation, building foundations, slabs-on-grade, paving, site structures, and construction operations.

B. Excavate to working elevation for piling work.

C. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with this Section.

D. Slope banks with machine to angle of repose or less until shored.

E. Grade top perimeter of excavation to prevent surface water from draining into excavation.

F. Trim excavation. Remove loose matter.

G. Remove lumped subsoil, boulders, and rock up to 1 cu yd measured by volume.
1. Remove rock to lines and grades required to permit installation of permanent construction as indicated on Drawings without exceeding the following dimensions:
a. 24 inches outside of concrete forms other than at footings;
b. 12 inches outside of concrete forms at footings;
c. 6 inches outside of minimum required dimensions of concrete cast against grade;

d. Outside dimensions of concrete walls indicated to be cast against rock with-out forms or exterior waterproofing treatments;
e. 6 inches beneath bottom of concrete slabs on grade;
f. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide;
g. As indicated on the Drawings.

H. Notify Engineer of unexpected subsurface conditions.

I. Correct areas over excavated with structural fill as directed by Landscape Architect/Engineer.

J. Remove excess and unsuitable material from site.

K. Repair or replace items indicated to remain damaged by excavation.

3.6 EXCAVATING WITHIN ROOT ZONES

A. Mechanical excavation practices are prohibited within the tree root zones as indicated on Drawings. All excavating is to be done by hand methods with the use of an Air Spade or approved equivalent such that the existing tree roots are maintained to the maximum extent practicable.

B. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct new construction. Notify the Engineer/Landscape Architect prior to any root cutting.

C. Excavation of soil must occur within the same week as the proposed grading activity or surface material placement. At no time will the exposed roots of the existing trees be allowed to dry out. Tree roots will be hand watered during any period when they are exposed.

3.7 SUBSOIL EXCAVATING

A. Excavate subsoil and topsoil from areas designated.

B. Stockpile excavated material meeting requirements for subsoil materials and topsoil material.

C. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

D. Remove excess excavated materials not intended for reuse from site.

E. Remove excavated materials not meeting requirements for from site.

F. Excavate subsoil from marked areas required for building foundations, construction operations, and other Work.

G. Proof roll bearing surfaces. Fill soft spots and compact uniformly to 95 percent of maximum density as determined by ASTM D1557.

H. Correct unauthorized excavation at no cost to Owner.

I. Backfill over-excavated areas under in accordance with specifications and as directed by the Engineer.

J. Excavate subsoil from areas to be further excavated, relandscaped, or regraded.

K. Do not excavate wet subsoil or excavate and process wet material to obtain optimum moisture content.

L. When excavating through roots, perform Work by hand and cut roots with sharp axe.

M. Benching Slopes: Horizontally bench existing slopes greater than 1: 4 to key placed fill material to slope to provide firm bearing.

N. Stability: Replace damaged or displaced subsoil as specified for fill.

3.8 TRENCHING

A. Excavate to utilities.

B. Excavate trenches to indicated gradients, lines, depths, and elevations. Cut trenches sufficiently wide to enable installation of utilities and allow inspection.

C. Hand trim excavation and leave free of loose matter. Hand trim for bell and spigot pipe joints.

D. Support pipe bells, joints, and conduit during placement and compaction of bedding fill.

E. Remove projecting stones and sharp objects along trench subgrade.

F. Coordinate backfilling with utilities testing.

G. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

H. Backfill trenches to required contours and elevations.

I. Place and compact fill materials as for Backfilling.

3.9 LINES AND GRADES

A. Lay pipes to lines and grades indicated on Drawings.
   1. Landscape Architect/Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Use laser-beam instrument with qualified operator to establish lines and grades.

C. Maintain grade alignment of pipe using string line parallel with grade line and vertically above centerline of pipe.
   1. Establish string line on level batter boards at intervals of not more than 25 feet (7.5 meters).

2. Install batter boards spanning trench, rigidly anchored to posts driven into ground on both sides of trench.
3. Set three adjacent batter boards before laying pipe to verify grades and line.
4. Determine elevation and position of string line from elevation and position of offset points or stakes located along pipe route.
5. Do not locate pipe using side lines for line or grade.

3.10 UNAUTHORIZED EXCAVATION

A. Immediately notify the Engineer prior to the commencement of any unauthorized excavation or backfilling work.

B. Backfill unauthorized excavation under footings, foundation bases, or retaining walls with compacted select granular material without altering the required footing elevation. Elsewhere, backfill and compact unauthorized excavation as specified for authorized excavation of the same classification.

3.11 BACKFILL EXAMINATION

A. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

B. Verify underground tanks are anchored to their own foundations to avoid flotation after backfilling.

C. Verify foundation or basement walls are braced to support surcharge forces imposed by backfilling operations.

3.12 BACKFILL PREPARATION

A. Compact subgrade to density requirements for subsequent backfill materials.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with structural fill and compact to density equal to or greater than requirements for subsequent fill material.

C. Scarify subgrade surface to depth of 6 inches.

D. Proof roll to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

E. Replace unsatisfactory soil with compacted backfill or fill material.

F. Survey locations of underground utilities for As-built Drawings and Record Documents.

G. Test and inspect underground utilities as specified.

H. Remove concrete formwork.

I. Remove trash and debris.

J. Install permanent or temporary horizontal bracing on horizontally supported walls

K. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities without additional compensation.

L. If unsatisfactory soil is encountered immediately notify Engineer before any work commences.

3.13 BACKFILLING

A. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

B. Place and compact backfill in excavations promptly.

C. Place backfill and fill soil materials in layers to specified depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

D. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

E. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is removed.

F. Backfill areas to contours and elevations indicated on Drawings.

G. Use unfrozen and unsaturated materials.

H. Place geotextile fabric over unstable subsoil.

I. Place geotextile fabric over fill prior to placing subsequent fill materials.

J. Place material in continuous layers as follows:
1. Soil Materials: Maximum 8 inches compacted depth.
2. Structural Fill Materials: Maximum 6 inches compacted depth.
3. Granular Fill: Maximum 6 inches compacted depth.

K. Employ placement method that does not disturb or damage other work.

L. Employ placement method so not to disturb or damage foundations, foundation perimeter drainage, foundation dampproofing, foundation waterproofing and protective cover, or utilities in trenches.

M. Maintain optimum moisture content of backfill materials to attain required compaction density.
1. Common Fill/Ordinary Borrow: 90 percent of the material's maximum dry density as determined by ASTM D1557 where placed above the Geotextile Delineation Fabric (Remediation Cap Fabric), and 92 percent in landscaped areas or 95 percent where placed within two feet of finished grade.

N. Backfill against supported foundation walls. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

O. Do not leave more than 50 feet of trench open at end of working day.

P. Protect open trench to prevent danger to the public.

Q. Make gradual grade changes. Blend slope into level areas.

R. Remove surplus backfill materials from site.

S. Leave fill material stockpile areas free of excess fill materials.

3.14 FILLING (GRADING)

A. Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations as indicated on Drawings.
   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. Fill areas to contours and elevations with unfrozen materials.

C. Place fill material in continuous layers and compact in accordance with schedule at end of this section.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Slope grade away from building minimum 5 percent slope for minimum distance of 10 ft, unless noted otherwise.

F. Make grade changes gradual. Blend slope into level areas.

G. Trim and rough grade area within the grading limits to a depth sufficient below the finish grades to accommodate topsoil, pavement, concrete and other finished surfaces.

H. Repair or replace items indicated to remain damaged by excavation or filling.

I. prevent erosion of the berm.

3.15 STOCKPILING

A. Stockpile materials on site at locations indicated by Landscape Architect/Engineer.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Prevent intermixing of soil types or contamination.

E. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

F. Cover to prevent windblown dust.

G. Stockpile soil materials away from edge of excavations.

H. Do not store within drip line of remaining trees.

I. For soil stockpiles left overnight, provide silt sock, strawbales, silt fence, or a combination of silt fence with strawbales around the stockpile perimeter.

J. Stockpile unsuitable or hazardous materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.16 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

3.17 TOLERANCES

A. Section 01 45 00 - Quality Control: Tolerances.

B. Top Surface of Backfilling Under Paved Areas or Lawn: Plus or minus 1 inch from required elevations.

C. Top Surface of Backfilling Paved Areas: Plus or minus 1/2 inch from required elevations.

D. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

E. Top Surface of Exposed Subgrade: Plus or minus 1 inch.

3.18 FIELD QUALITY CONTROL

A. Section 01 45 00 - Quality Control 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Provide field quality control testing by a qualified independent geotechnical engineering testing agency. Testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthmoving only after test results for prior work comply with requirements.

C. Repair and reestablish grades to specified tolerances where graded surfaces have been disturbed or altered due to construction activities, weather conditions or other means.

D. Request inspection of excavation and controlled fill operations in accordance with applicable code.

E. Request visual inspection of bearing surfaces by Landscape Architect/Engineer inspection agency before installing subsequent work.

F. Request inspection of foundations in accordance with applicable code.

G. Perform laboratory material tests in accordance with ASTM D1557.

H. Perform in place compaction tests in accordance with the following:
   1. Density Tests: ASTM D1556, ASTM D2167, or ASTM D2922.
   2. Moisture Tests: ASTM D3017.

I. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.

3.19 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
   1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
   2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.20 PROTECTION OF FINISHED WORK

A. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

SECTION 32 13 13 - CONCRETE PAVING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Aggregate subbase and base course.
   2. Concrete paving for:
      a. Concrete sidewalks
      b. Concrete slabs

B. Related Requirements:
   1. Section 31 20 00 – Earth Moving

1.3 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:
   1. AASHTO M324 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

B. Standard Specifications: State of New Hampshire, Department of Transportation, Standard Specifications for Highways and Bridges, latest edition.

C. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

D. ASTM International:
   1. ASTM A184/A184M - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
   2. ASTM A185/A185M - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
   3. ASTM A497/A497M - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
   4. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   5. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
   6. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
   7. ASTM A775/A775M - S Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
   8. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
   9. ASTM A934/A934M - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.

10. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
11. ASTM C33 - Standard Specification for Concrete Aggregates.
12. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
13. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
14. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
15. ASTM C150 - Standard Specification for Portland Cement.
16. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
17. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
18. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
19. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
20. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
21. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
22. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
23. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
24. ASTM C979 - Standard Specification for Pigments for Integrally Colored Concrete.
25. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
26. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
27. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
28. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
29. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
30. ASTM C1371[-2004a] - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
31. ASTM C1549[-2004] - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
32. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
33. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
34. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
35. ASTM E408[-1971(1996)e1] - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
36. ASTM E903[-1996] - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
37. ASTM E1918[-1997] - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
38. ASTM E1980[-2001] - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

1.4 PRE-INSTALLATION MEETINGS

A. Convene site meeting minimum one week prior to commencing work of this section.

1.5 SUBMITTALS

A. Product Data:
   1. Submit data on concrete materials, joint filler, fibers, admixtures, and curing compounds.

B. Design Data:
   1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
      a. Hot and cold weather concrete work.
   2. Identify mix ingredients and proportions, including admixtures.
   3. Identify chloride content of admixtures and whether or not chloride was added during manufacture.

C. Source Quality Control Submittals: Indicate results of shop tests and inspections.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 and NHDOT Standard Specifications (Latest Edition).

B. Obtain cementitious materials from same source throughout.

C. Perform Work in accordance with Local, State and Federal Standards.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum five years documented experience.

B. Installer: Company specializing in performing work of this section with minimum five years documented experience.

1.8 AMBIENT CONDITIONS

A. Provide temporary gravel surface parking areas to accommodate construction personnel.

B. If Site space is not adequate, provide additional off-Site parking.

C. Permanent Pavements and Parking Facilities: Avoid traffic loading beyond paving design capacity. Tracked vehicles are not allowed.

D. Maintenance:
   1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, ice, and the like.
   2. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original condition.

E. Removal, Repair:
   1. Remove temporary materials and construction when permanent paving is usable.
   2. Repair existing facilities damaged by use, to original condition.

F. Mud from Site vehicles: Provide means of removing mud from vehicle wheels before entering streets.

G. Do not place concrete when base surface temperature is less than 40 degrees F or surface is wet or frozen.

PART 2 PRODUCTS

2.1 AGGREGATE SUBBASE

A. Aggregate Subbase: As specified in plans.

2.2 CONCRETE PAVING

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
   1. Use flexible or curved forms for curves with a radius 100 feet or less.
   2. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

B. Reinforcement
   1. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
   2. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.
   3. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
   4. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 deformed bars.
   5. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.
   6. Plain Steel Wire: ASTM A 82, as drawn.
   7. Deformed-Steel Wire: ASTM A 496.
   8. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.
   9. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.
   10. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice."
   11. Zinc Repair Material: ASTM A 780.

C. Fiber Reinforcement
   1. Synthetic Fiber: minimum 4-inches thick with 6-inches at all tip-downs.
      a. Approach slabs and modular expansion joint blockouts: 5 lb/cy, macro (dosage rate shall not be field modified as fiber replaces top mat of reinforcing).
      b. Pedestrian sidewalks on soil: 1.5 lb/cy, micro.

D. Concrete Materials:
   1. Cementitious Material: Use one of the following cementitious materials, of the same type, brand, and source throughout the Project:
      a. Portland Cement: ASTM C 150, Type I or II. Supplement with the following:
         1) Fly Ash: ASTM C 618, Class C or F.
         2) Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
   2. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate, uniformly graded. Provide aggregates from a single source.
   3. Water: ASTM C 94/C 94M.

4. Air-Entraining Admixture: ASTM C 260.
5. Chemical Admixtures: ASTM C 494/C 494M, of type suitable for application, certified by manufacturer to be compatible with other admixtures and to contain no more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

2.3 MIXES

A. Concrete Mix
1. Prepare design mixtures, proportioned according to ACI 301, with the following properties:
   a. Compressive Strength (28 Days): 3000 psi.
   b. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
   c. Slump Limit: 4 inches, plus or minus 1 inch.
   d. Air Content: 6 percent plus or minus 1.5 percent for 3/4-inch nominal maximum aggregate size.
2. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
3. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement according to ACI 301 requirements as follows:
   a. Fly Ash or Pozzolan: 25 percent.
   b. Ground Granulated Blast-Furnace Slag: 50 percent.
   c. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 25 percent.
4. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd.
   a. Approach slabs and modular expansion joint blockouts: 5 lb/cy, macro (dosage rate shall not be field modified as fiber replaces top mat of reinforcing).
   b. Pedestrian sidewalks on soil: 1.5 lb/cy, micro.

B. CONCRETE MIXING
1. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.
   a. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes

2.4 FINISHES

A. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

2.5 ACCESSORIES

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1752, cork or self-expanding cork.

B. Curing Compound: In accordance with NHDOT Standard Specifications (Latest Edition).

C. Joint Sealers: ASTM D6690; Type II or Type III; hot applied type.

2.6 SOURCE QUALITY CONTROL

A. Submit proposed mix design of each class of concrete to appointed firm for review prior to commencement of Work.

B. Tests on cement, aggregates, and mixes will be performed to ensure conformance with specified requirements.

C. Test samples in accordance with ACI 301.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify compacted subgrade is dry and ready to support paving and imposed loads.
   1. Proof roll subbase in minimum two perpendicular passes to identify soft spots.
   2. Remove soft subbase and replace with compacted fill.

B. Verify gradients and elevations of base are correct.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Moisten substrate to minimize absorption of water from fresh concrete.

B. Remove loose material from compacted subbase surface immediately before placing concrete.

C. Coat surfaces of manhole and catch basin frames with oil to prevent bond with concrete paving.

D. Notify Architect/Engineer minimum 24 hours prior to commencement of concreting operations.

3.3 INSTALLATION

A. Subbase:
   1. Aggregate Subbase: Install as specified.

B. Forms:
   1. Place and secure forms and screens to correct location, dimension, profile, and gradient.
   2. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Reinforcement:
   1. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
   2. Clean reinforcement of loose rust and mill scale, earth, ice or other bonding reducing materials.
   3. Place reinforcing as indicated on Drawings.
   4. Place dowels/reinforcing to achieve paving and curb alignment as detailed.

D. Placing Concrete:
   1. Coordinate installation of snow melting components.
   2. Place concrete in accordance with ACI 301.
   3. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
   4. Place concrete using the slip form technique.
   5. Ensure reinforcing, inserts, embedded parts, formed joints are not disturbed during concrete placement.

6. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
7. Place concrete to indicated pattern.
8. Screed pavement surfaces with a straightedge and strike off.
9. Commence initial floating using bull floats or darbies to provide an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
10. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
    a. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
    b. Remove snow, ice, or frost from subbase surface before placing concrete. Do not place concrete on frozen surfaces.
    c. Do not use frozen materials or materials containing ice or snow.
    d. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.
11. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
    a. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water.
    b. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
    c. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

E. Joints
1. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
2. When joining to existing paving, place traverse joints to align with previously placed joints unless otherwise indicated.
3. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.
4. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
5. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, to match jointing of existing adjacent concrete pavement.
6. Edging: Tool edges of pavement and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

F. Finishing:
1. Float Finishing
    a. General: Do not add water to concrete surfaces during finishing operations.
    b. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to

power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1) Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

c. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on pavement surface according to manufacturer's written instructions.

1) Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.

2) After curing, lightly work surface with a steel wire brush or abrasive stone and water to expose nonslip aggregate.

2. Sidewalk Paving: Light broom and trowel joint edges. Wood float.
3. Inclined Vehicular Ramps: Broomed perpendicular to slope.
4. Place curing compound sealer on exposed concrete surfaces immediately after finishing.

G. Curing and Protection

1. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
2. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
3. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
4. Comply with ACI 306.1 for cold-weather protection.
5. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
6. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
7. Curing Methods: Cure concrete by moisture-retaining-cover curing or curing compound, as follows:
   a. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
   b. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.4 TOLERANCES

A. Section 01 40 00 - Quality Control: Tolerances.

B. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/4 inch.
4. Joint Spacing: 3 inches.
5. Contraction Joint Depth: Plus 1/4 inch, no minus.
6. Joint Width: Plus 1/8 inch, no minus.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: CONTRACTOR to engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Test composite samples of fresh concrete obtained (ASTM C 172) according to the following requirements:
   1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
      a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
   2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
   3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
   4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
   5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
   6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
   7. A compressive-strength test: The average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Report test results in writing to Engineer within 48 hours of testing. Reports of compressive-strength tests to include Project identification, name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Perform additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at CONTRACTOR's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Prepare test and inspection reports.

J. Inspect reinforcing placement for size, spacing, location, support.

K. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.6 REPAIRS AND PROTECTION

A. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

C. Drill test cores, where directed by Owner Representative when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

D. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

E. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 32 14 00 - UNIT PAVING

PART 1 - GENERAL

1.01 DESCRIPTION

A. The General Documents, as listed on the Table of Contents, and applicable parts of Division 1, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.

B. Examine all other sections of the Specifications for requirements which affect the work of this Section, whether or not such requirements are particularly mentioned herein.

C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 SCOPE

A. The work of this Section consists of all paving, surfacing and curbing work and related items as indicated on the Drawings and/or as specified herein, and includes, but is not limited to, the following:
   1. Concrete plank pavers of different varieties

1.03 RELATED WORK

A. Examine all Drawings and all other Sections of the Specifications for requirements affecting the work described below.

1.04 SUBMITTALS

A. Samples: Prior to ordering the below listed materials, submit representative samples to Owner's Representative for selection and approval, as follows. Do not order materials until Owner Representative's approval has been obtained. Delivered materials shall closely match the approved samples.
   1. Provide manufacters' information on projects in this section: polymeric sand, edge restraints, permeable spacers, and plank pavers.
   2. Concrete plant pavers
      3. Samples for verification: Five representative full-size samples of each paver type, thickness, color and finish that indicate the range of color variation and texture expected upon project completion.
      2. Accepted samples become the standard of acceptance for the product produced.
      3. Test results from an independent testing laboratory for compliance of concrete pavers with ASTM C 936.
      4. Manufacturer's catalog product data, installation instructions, and material safety data sheets for the safe handling of the specified materials and products.

B. Polymeric Joint Sand
   1. Test results from an independent testing laboratory for sieve analysis per ASTM C 136 conforming to the grading requirements of ASTM C 144.

2. Samples for Initial Selection: Provide three representative samples in containers of Polymeric Joint Sand material, cured and dried, for color selection.
3. Samples for Verification: Provide three one pound samples in containers of Polymeric Joint Sand.

C. Paving Installation Contractor
   a. Job references from a minimum of three projects similar in size and complexity.

D. Sample Installations
   a. Build sample panels of not less than one hundred fifty (150) square feet in the area designated by the Owner's Representative:
      2. Obtain Owner Representative's acceptance of the visual quality of sample installations before proceeding with the final work.
      3. If the first installations are not approved, the Contractor shall provide additional samples until an approved sample installation is obtained for each of the above.
      4. If approved, the sample installations shall become part of the final paving.

1.05 PRODUCT HANDLING AND STORAGE

A. Deliver masonry materials in original sealed containers marked with name of manufacturer and identification of contents. Store masonry materials under waterproof covers on planking clear of ground and protect from handling damage, dirt, stain, water and wind.

   1. Protect concrete masonry units during storage and construction against moisture, soiling, staining and physical damage.

B. Take all necessary precautions to prevent all items from chipping, cracking, or other damage during the transportation of these materials to the project, unloading and storage on the site. Do not use pinch or wrecking bars without protecting edges of stone, concrete masonry units, and brick with wood or other rigid materials. Lift with wide-belt type slings or vacuum lifts wherever possible; do not use wire rope or ropes containing tar or other substances that might cause staining. If required, use wood rollers and provide cushion at end of wood slides. Damaged items shall not be installed, and should any damaged items be found in constructed work, such items shall be removed immediately and replaced, and the Contractor shall assume all expenses incurred therefrom.

C. Store masonry units on wood skids or pallets, covered with non-staining, waterproof membrane. Place and stack skids and stones, concrete masonry units or bricks to distribute weight evenly and to prevent breakage or cracking of stones.

D. Stored materials shall be adequately protected against moisture by (1) stacking in such a manner as to allow a complete circulation of air under each stack, and (2) covering each stack, top and sides with a waterproof paper or membrane. Coverings shall remain in place at all times, when not working from the particular stack.

1.06 REFERENCES AND STANDARDS

A. Except as modified by governing codes and by the Contract Documents, comply with applicable provisions and recommendations of the following:

1. NHDOT Standard Specifications for Road and Bridge Construction, latest edition.
2. AASHTO: American Association of State Highway and Transportation Officials, latest edition.
3. ASTM International, latest edition:
    a. C 33, Standard Specification for Concrete Aggregates.
    b. C 67, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile, Section 8, Freezing and Thawing.
    c. C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
    d. C 140, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
    e. C 144, Standard Specifications for Aggregate for Masonry Mortar.
    f. D 448, Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
    g. C 936, Standard Specification for Solid Concrete Interlocking Paving Units.
    h. C 979, Standard Specification for Pigments for Integrally Colored Concrete.
    i. D 698, Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 5.5 lb (24.4 N) Rammer and 12 in. (305 mm) drop.
    j. D 977, Standard Specification for Emulsified Asphalt.
    k. D 1557, Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 10 lb (44.5 N) Rammer and 18 in. (457 mm) drop.
    l. C 1645, Standard Test Method for Freeze-thaw and De-icing Salt Durability of Solid Concrete Interlocking Paving Units
    m. D 1883, Test Method for California Bearing Ratio of Laboratory-Compacted Soils.
    n. D 2940, Graded Aggregate Material for Bases or Subbases for Highways or Airports.
    o. D 3381, Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.
    p. D 4254, Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
4. ADA: Americans with Disabilities Act, latest edition.

1.07 QUALIFICATIONS

A. The paving work shall be performed by a Contractor or Subcontractor with a minimum of 5 years of acceptable experience in the installation of materials specified herein on projects comparable to this project and under the supervision of a qualified foreman with a minimum of 5 years of experience.

1.08 EXAMINATION OF CONDITIONS

A. The Contractor shall fully inform themselves of existing conditions of the site and shall be fully responsible for carrying out all work required to fully and properly execute the work of the Contract, regardless of the conditions encountered in the actual work. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed.
B. The Contractor shall be solely responsible for judging the potential need for storing materials temporarily and/or re-handling items prior to final installation.

1.09 ACCESSIBILITY CODES

A. From time to time there are changes made in the federal and /or state accessibility and /or building codes or it is determined that different codes are applicable to a site. Such determinations or changes may occur during the course of the construction of this project. If changes become necessary to meet codes a change order or other appropriate field directive may be issued by the City to cover statutory requirements.

PART 2 - PRODUCTS

2.01 CONCRETE PLANK PAVERS

A. Concrete Unit Paver

MANUFACTURER Ideal Concrete Block
45-55 Power Road, Westford, MA 07886
232 Lexington Street, Waltham, MA 02452
www.Idealblock.com
Local salesperson Judy True, JTrue@IdealConcreteBlock.com 978-805-8024.

a. Pavers for the entry plaze shall be Ideal Boston Colonial, or approved equal.
   1. Color: Beacon Hill blend
   2. Finish:
      a. Paver A: Premier Endurocolor
   3. Edge: Chamfered
   4. Dimensions: 4” X 8” X 2 3/8”

Or approved equal.

b. Pavers for the amphitheatre plaza shall be Ideal Andover 5511, or approved equal
   1. Color: Oxford Gray
   2. Finish: Smooth
   3. Edge: Minimal chamfered edge
   4. Dimensions: 5 ½” X 11” X 2 ¾”
   5. *As a permeable pavement provides 7/5% void space

Or approved equal.

B. Pavers shall meet the following minimum material and physical properties set forth in ASTM C 936, Standard Specification for Interlocking Concrete Paving Units. Efflorescence is not a cause for rejection.
   1. Average compressive strength 8,000 psi (55 MPa) with no individual unit under 7,200 psi (50 MPa).
   2. Average absorption of 5% with no unit greater than 7% when tested according to ASTM C 140.
   3. Resistance to 50 freeze-thaw cycles, when tested according to ASTM C1645, with no breakage greater than 1.0% loss in dry weight of any individual unit. Conduct this test method not more than 12 months prior to delivery of units.

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

D. Maximum allowable breakage of product is 5%.

E. Bituminous concrete setting bed
1. At the entry plaza, concrete pavers shall be installed upon an bituminous setting bed or base.
2. All pavement components (top course, base course, processed gravel, bank run gravel, etc), including pavement materials and placement methods, shall meet the current requirements from the State of New Hampshire, Department of Transportation, latest edition.
3. The Contractor shall determine the exact proportions to produce the best possible mixture for construction of the bituminous setting bed to meet construction requirements.

F. Sand for setting bed shall consist of clean, inert, hard, durable grains of quartz or other hard, durable rock, free from clay or loam, surface coatings, and plastic material, with the following gradation limitations, as determined by ASTM C33 requirements:

1. Setting bed:

U.S. Sieve No.	Percent Passing by Weight
3/8 in.	100
#4	95 to 100
#8	70 to 100
#16	50 to 85
#30	25 to 60
#50	10 to 30
#100	2 to 10
#200	---------

G. EDGE RESTRAINTS shall be Industrial Pave Edge as manufactured by Pave Tech, Inc. (https://www.pavetech.com/), local distributor Pavers by Ideal (617) 894-3200, or approved equal.

H. POLYMERIC SAND for joints manufactured by Techniseal® RG+, or approved equal.
1. Product Type: Dry mix, contains polymeric binding agent, activated with water.
2. Color: Grey
3. Polymeric sand for joints shall meet the following minimum material and physical properties as follows:
   a. Compression Strength: proven resistance to compression of 550 PSI after drying for 7 days under controlled conditions (73°F (23°C) at 50% humidity). Test sand sample shape: cylinder (2 in. (5 cm) dia. X 4 in. (10 cm) high).

I. Processed gravel fill as specified.

J. PERMEABLE JOINT OPENING AGGREGATE shall conform to ASTM C 33 and gradation requirements below.

PERMEABLE JOINT OPENING AGGREGATE
GRADATION REQUIREMENTS

1/8 to 3/16 inch granite chips	
Sieve Size	Percent Passing
1/4 in (6 mm)	97 to 100
No. 4 (4.75 mm)	70 to 83
No. 8 (2.36 mm)	37 to 50
No. 16 (1.18 mm)	0 to 12
pan	

K. PERMEABLE SPACERS

Plastic Permeable Spacer Tabs shall be by Plastidyne, Brimley Rd., Unit 24-25, Toronto, ON, M1J-1A4, (647) 404-0750, or approved equal.

1. Material Shape: L Spacer (Running Bond)
2. Spacer Lug Size: 10mm
3. Spacer Lug Height: 37mm

PART 3 – EXECUTION

3.01 MASONRY IMPLEMENTATION

A. Contractor shall check dimensions shown on Contract Drawings at the site by accurate field measurements before final submittal of Shop Drawings and before final fabrication of masonry work. Coordinate installation tolerances to ensure proper fit of final masonry work.

B. Contractor shall review installation procedures and sequence to ensure proper coordination with other subcontractors and suppliers whose work is affected by the delivery schedule and installation of masonry work.

C. Construction tolerances for masonry work: This will apply to exposed surfaces of work that is installed.

1. Variation from Plumb: Do not exceed one-eighth inch in ten feet.
2. Variation from Level: Do not exceed one-eighth inch for individual grades or one-eighth inch in ten feet for level line.

D. Cut masonry units using motor-driven saws to provide clean, sharp, unchipped cut units as required to provide pattern shown and to fit adjoining work neatly. Protect mortar materials and masonry work accessories from weather, moisture and contamination with earth and other foreign materials.

E. Crushed stone, sand and processed gravel fill shall be as specified under Section 31 20 00 – Earthwork.

F. Protect masonry work against freezing when ambient temperature is 40 degrees F. and falling.

G. Do not use frozen materials or materials mixed or coated with ice or frost. Do not use salt to thaw ice in anchor holes or slots. Do not lower the freezing point or mortar by the use of admixtures or anti-freeze agents, and do not use calcium chloride in mortar or grout. Do not build on frozen work; remove and replace masonry work damaged by frost or freezing.

H. During all seasons, protect partially completed masonry work against weather when work is not in progress. Cover top of walls, stairs and posts with strong, waterproof, non-staining membrane extending down both sides of walls and anchor securely in place.

3.02 INSTALLATION

A. SAND SETTING BED

1. Place in panels between 3/4 inch (20 mm) high screed rails spaced approximately 12 ft (4 m). Set the depth screed rails carefully to bring the sand bedding material to proper grade, to insure proper finished grade. Place sand bedding material between the parallel screed rails. Rake and screed smooth with strike board. Fill any depressions with fresh sand to produce a smooth, firm and even setting bed after each pass. Use screed rails to achieve a level setting bed conforming to elevations and slope shown on the drawings. Correct irregularities or evenness in the grade of the concrete base surface with sand bedding materials only.

B. EDGING

1. Existing curbing, pavers on edge and edging shall be securely set on the base as shown on the Drawings. Established structures may be used. All shall be accurate and true.

C. PAVERS

1. Pavers shall be installed plumb, level and true to line and grade. Finished work shall conform to and align with elevations shown on the Drawings. Care shall be taken during the layout to minimize cutting.
2. Pavers shall be installed hand tight to achieve uniform joints approximately 1/8"-wide between pavers. String lines shall be used frequently to hold pattern lines true and accurate.
3. Full units shall be laid first and cuts done subsequently. Use manufactured edge pieces or, as required, cut full units with a masonry saw to fit accurately, neatly, and without damaged edges. Where cutting will result in a space less than 25% of the size of a full unit a 1:2:4 concrete mix may be used, at the discretion of the Owner Representative.
4. Care should be taken when transporting material over uncompacted pavers to prevent damage to the pavement.
5. Any irregularity in the finished surface which varies 1/8 inch from a true surface shall be corrected.

6. Any stains or efflorescence that occurs during construction must be removed in accordance with the manufacturer's recommendations.

D. JOINTING

1. Polymeric joint sand shall be spread and broomed over the installed pavers per manufacturer's instructions. Do not apply polymeric sand to wet pavement. Check to ensure that pavers are completely dry prior to installing polymeric joint sand. At least one pass of the plate vibrator shall be made to consolidate the sand in the joints. Remaining sand shall be swept into the joints until they are filled flush to the top of the pavers. Apply water to joint material per manufacturer’s instructions.

END OF SECTION

SECTION 32 31 13 - CHAIN LINK FENCE

PART 1 - GENERAL

1.01 REFERENCES

A. Examine all Plans and Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

B. Coordinate work with that of all other trades affecting or affected by the work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 SCOPE

A. Furnish labor and materials to complete all work outlined in the plans herein for Chain Link Fence, but not limited to the following:

1. Polymer coated steel chain link fabric
2. Polymer coated galvanized steel framework and fittings
3. Concrete footings
4. Excavation, backfilling, compacting of materials
5. Testing of completed installation
6. Operation and maintenance instructions
7. Guarantees

B. Request for Deviations from the Specifications: If any deviations from the specifications are proposed, contractors must include written description and reasons for deviations.

1.03 QUALITY ASSURANCE

A. See provisions of the GENERAL REQUIREMENTS for information regarding guarantees and warranties for work under this contract.

B. Except as modified by governing codes and by the Contract Documents, comply with applicable provisions and recommendations of the following:

1. State of New Hampshire, Standard Specifications for Highways and Bridges, latest edition.
2. AASHTO: American Association of State Highway and Transportation Officials, latest edition.
3. ASTM F552 Standard Terminology Relating to Chain Link Fencing
4. ASTM F567 Standard Practice for Installation of Chain Link Fence
5. ASTM F626 Specification for Fence Fittings
6. ASTM F668 Specification for Polymer Coated Chain Link Fence Fabric
7. ASTM F934 Specification for Standard Colors for Polymer-Coated Chain Link
8. ASTM F1043 Specification for Strength and Protective Coatings of Steel Industrial Chain Link Fence Framework
9. ASTM F1083 Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures

1.04 SUBMITTALS

A. Shop Drawings: Prior to ordering materials, submit shop drawings and/or product literature to the Owner’s Representative for approval. Do not order materials until Owner’s Representative's approval has been obtained. Delivered materials shall closely match the approved samples.

1. Chain link fabric, structural support members, hardware, and footings: Provide a detailed shop drawing for a typical fence section and product literature.

1.05 DELIVERY AND HANDLING

A. The Contractor shall be responsible for timing the delivery of all materials so as to minimize on-site storage time prior to installation. All stored materials and items must be protected from

weather, careless handling, or vandalism. Location for storage shall be approved by the Owner's Representative prior to any items being brought to the site.

B. Provide temporary storage of pipe and other materials in such a manner as to prevent damage and to maintain them in "new" condition until they are incorporated into the work.

1.06 EXAMINATION OF EXISTING CONDITIONS

A. The Contractor shall fully inform himself of existing conditions of the site before submitting his bid and shall be fully responsible for carrying out all work required to fully and properly execute the work of the Contract, regardless of the conditions encountered in the actual work. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed, except those conditions described under the GENERAL CONDITIONS.

B. All areas to be irrigated shall be inspected by the Contractor before starting work and any defects, such as incorrect grading, drainage problems etc., shall be reported to the Owner's Representative prior to beginning the work. The commencement of work by the Contractor shall indicate the Contractor's acceptance of the areas to be irrigated, and the Contractor shall assume full responsibility for the work of this Section.

C. The Contractor shall be solely responsible for judging the full extent of work requirements involved, including but not limited to the potential need for storing materials temporarily and/or re-handling items prior to final installation.

D. Contractor shall verify all utility conditions and elevations prior to work. Before construction starts, all utility companies, public and private, must be contacted, including those in control of utilities not shown on this plan. The Contractor shall contact "DIG SAFE" 1-800-322-4844 well in advance of beginning work to allow for the accurate identification of utilities. The Contractor shall report any discrepancies in writing to the General Contractor and/or Owner's Representative and receive written instructions prior to proceeding.

1.07 ORDINANCES, LICENSES, PERMITS AND FEES

A. The work under this Section shall comply with all ordinances and regulations of authorities having jurisdiction. The Contractor shall apply for and obtain all necessary permits and arrange for all mandatory inspections. His bid shall include all fees for permits and certificates and all costs in connection with inspection and any charges by the Water Department, Utility Company, or other authorities for work done by them and charged to the Contractor.

1.08 TESTING

A. At the completion of the work, all parts of the installation shall be thoroughly cleaned. All moving parts and fittings shall be lubricated.

1.09 OPERATION AND MAINTENANCE INSTRUCTIONS

A. The Contractor shall instruct the Client's representative in the maintenance and operation of the system.

1.10 MANNER OF CONDUCTING THE WORK

A. The work shall be conducted with prime consideration given to the following:
   1. Compliance with Americans with Disabilities Act requirements.
   2. Compliance with governing laws and building codes.
   3. Safety, protection, and convenience of the public and workmen.
   4. Protection of the existing building structure, materials and finishes to remain from damage.
   5. Minimization of dirt and dust proliferation.
   6. Avoidance of any damage to existing vegetation to remain.

B. All work shall be done in accordance with the governing laws and building codes and all necessary permits required for the Irrigation and requested work shall be procured by the Contractor. Legal exits at all times shall be provided.

1.11 GUARANTEES

A. The Contractor shall obtain in the Client's name, the standard written manufacturer's guarantee of all materials furnished under this Section where such guarantees are offered in the manufacturer's published product literature. All of these guarantees shall be in addition to, and not in lieu of, other liabilities which the Contractor may have under law.

B. In addition to manufacturers' guarantees, the Contractor shall warrant the fencing and both parts and labor, for a period of one year from date of acceptance by the Owner's Representative. The Contractor shall be held strictly responsible for all parts of his work. If failure in the system or appurtenances develops within one (1) year of the date of final approval and acceptance of the work, the Contractor shall be required to replace all faulty materials at his full expense.

C. Labor and materials to fulfill the requirements of this warranty shall be furnished by the Contractor at no additional cost to the Client. All labor shall include premium time to correct any faulty material or workmanship.

PART 2 – PRODUCTS

2.01 GENERAL

A. All materials to be used shall be new and without flaws or defect and of quality and performance as specified.

2.02 MANUFACTURERS

A. Chain link fence: fabric, framework, posts, rails, and fittings shall be manufactured by Merchants Metals www.merchantsmetals.com, Phone: (888) 260-1600 or approved equal.

2.03 CHAIN LINK FABRIC

A. Steel Chain Link Fabric:
   1. Polymer Coated Steel Fabric: ASTM F668, metallic coated steel core wire:
      a. 9 gauge
      b. class 2b fused and adhered
      c. 2" mesh
      d. Selvage: K&T (knuckle finish at one end, twist at the other)
      e. Color – Black to match coating and hardware in compliance with ASTM F934.

2.04 ROUND STEEL PIPE FENCE FRAMEWORK

A. Round steel pipe and rail: Schedule 40 standard weight pipe, in accordance with ASTM F1083, Heavy Industrial Grade with a minimum steel yield strength of 50,000 psi. Hot dip galvanized zinc interior and exterior 4.0 oz/ft² coating.

B. Polymer Coated Pipe: Polymer coated pipe shall have a PVC coating fused and adhered to the exterior zinc coating of the galvanized pipe in accordance with ASTM F1043. The minimum thickness of the PVC coating shall be 10-mils. Color to match fabric, black per ASTM F934.

2.06 FITTINGS

A. Tension and Brace Bands: Galvanized pressed steel complying with ASTM F626, minimum steel thickness of 12 gauge (0.105 in.), minimum width of 3/4 in. and minimum zinc coating of 1.20 oz/ft² (366 g/m²). Secure bands with 5/16 in. galvanized steel carriage bolts.

B. Terminal Post Caps, Line Post Loop Tops, Rail and Brace Ends, Boulevard Clamps, Rail Sleeves: In compliance to ASTM F626, pressed steel galvanized after fabrication having a minimum zinc coating of 1.20 oz/ft².

C. Tension Bars: In compliance with ASTM F626. Galvanized steel one-piece length 2 in. less than the fabric height. Minimum zinc coating 1.2 oz. /ft². Bars for 2 in. mesh shall have a minimum cross section of 3/16 in. by 3/4 in.

D. Polymer Coated Color Fittings: In compliance with ASTM F626, minimum coating thickness 0.006 in. fused and adhered to the zinc coated fittings, color: Black

2.07 TIE WIRE and HOG RINGS

A. Basic commercial / industrial applications - specify 9-gauge core aluminum alloy ties and hog rings per ASTM F626.

B. Added security or fence containing privacy slats specify 9-gauge core (0.148) steel Galvanized Before Weave (GBW) with preformed power fastened wire ties and preformed hog rings having minimum zinc coating 1.20 oz/ft² (366 g/m²) per ASTM F626.

C. Match the coating, class, and color to that of the chain link fabric.

2.08 CONCRETE

A. Concrete for post footings shall have a 28-day compressive strength of 3,000 psi.

PART 3 - EXECUTION

3.01 CLEARING FENCE LINE

A. Clearing: Surveying, clearing, grubbing, grading and removal of debris for the fence line or any required clear areas adjacent to the fence is the responsibility of the contractor.

3.02 FRAMEWORK INSTALLATION

A. Top rail: When specified, install 21 ft. lengths of rail continuous thru the line post. Splice rail using top rail sleeves minimum 6 in. long. Rail shall be secured to the terminal post by a brace band and rail end. Bottom rail or intermediate rail shall be field cut and secured to the line posts using boulevard clamps or brace band with rail end.

B. Terminal posts: End and corner posts shall be braced and trussed. The horizontal brace rail and diagonal truss rod shall be installed in accordance with ASTM F567.

C. Tension wire: Shall be installed 4 in. up from the bottom of the fabric. Fences without top rail shall have a tension wire installed 4 in. down from the top of the fabric. Tension wire to be stretched taut, independently and prior to the fabric, between the terminal posts and secured to the terminal post using a brace band. Secure the tension wire to each line post with a tie wire.

3.03 CHAIN LINK FABRIC INSTALLATION

A. Chain Link Fabric: Install fabric to outside of the framework maintaining a ground clearance of no more than 2 inches. Attach fabric to the terminal post by threading the tension bar through the fabric; secure the tension bar to the terminal post with tension bands and 5/16 in. carriage bolts spaced no greater than 12 inches on center. Fabric to be stretched taut free of sag and secured to the line post with tie wires spaced no greater than 12 inches on center and to horizontal rail spaced no greater than18 inches on center. Wrap the tie around the post or rail and attached to a fabric wire picket on each side of the post or rail by twisting the tie wire around the fabric wire picket two full turns, cut off excess wire and bend over to prevent injury. Preformed 9-gauge power-fastened wire ties shall be installed following ASTM F626: Wrap the tie a full 360° around the post or rail and fabric wire picket, using a variable speed drill, twist the two ends together three full turns, cut off any excess wire and bend over. Secure the fabric to the tension wire by crimping hogs rings around a fabric wire picket and tension wire.

3.04 NUTS AND BOLTS

A. Bolts: Carriage bolts used for fittings shall be installed with the head on the secure side of the fence. All bolts shall be peened over to prevent removal of the nut.

3.05 CLEAN UP

A. Clean Up: The area of the fence line shall be left neat and free of any debris caused by the installation of the fence.

END OF SECTION

SECTION 32 32 00 – CONRETE BLOCK WALL

PART 1 - GENERAL

1.00 REFERENCES

A. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of his trade.

B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.01 SCOPE OF WORK

A. The work of this Section consists of all Site Improvements work and related items as indicated on the Drawings and/or specified herein and includes, but is not limited to, the following:

1. Segmental retaining wall system (amphitheater retaining wall and seating wall)

1.02 RELATED WORK

A. The following items of related work are specified and included in other Sections of the Specifications:

1. Section 32 14 00 Unit Paving
2. Section 02 20 00 Earthwork

1.03 REFERENCES AND STANDARDS

A. Except as modified by governing codes and by the Contract Documents, comply with applicable provisions and recommendations of the following:

1. Standard Specifications: State of New Hampshire, Department of Transportation, Standard Specifications for Highways and Bridges, latest edition.
2. AASHTO: American Association of State Highway and Transportation Officials, latest edition.
3. ASTM: American Society for Testing and Materials, latest edition.
4. ADA: Americans with Disabilities Act, latest edition.
5. AHDGA: American Hot Dip Galvanizers Association, latest edition.

1.04 SUBMITTALS

A. Samples: Prior to ordering the below listed materials, submit representative samples to Owner Representative for selection and approval, as follows. All samples, if approved may be incorporated into the final work. Do not order materials until Owner Representative's approval has been obtained. Delivered materials shall closely match the approved samples.

1. Concrete segmental retaining wall with seat cap

B. Shop Drawings and Product Literature: Prior to ordering the below listed materials, submit shop drawings or product literature to the Owner Representative for approval as

follows. Do not order materials until Owner Representative's approval has been obtained. Delivered materials shall closely match the approved samples.

1 Concrete segmental retaining wall with seat cap: Shop Drawings and Product literature.

1.05 ACCESSIBILITY CODES

A. From time to time there are changes made in the federal and /or state accessibility and/or building codes or it is determined that different codes are applicable to a site. Such determinations or changes may occur during the course of the construction of this project. If changes become necessary to meet codes a change order shall be issued by the Owner to cover statutory requirements.

1.06 EXAMINATION OF EXISTING CONDITIONS

A. The Contractor shall fully inform himself of existing conditions of the site before submitting his bid, and shall be fully responsible for carrying out all work required to fully and properly execute the work of the Contract, regardless of the conditions encountered in the actual work.

B. All areas shall be inspected by the Contractor before starting work and any defects, such as incorrect grading, drainage problems etc., shall be reported to the Owner Representative prior to beginning the work.

C. The Contractor shall be solely responsible for judging the full extent of work requirements involved, including but not limited to the potential need for storing materials temporarily and/or rehandling items prior to final installation.

D. Contractor shall verify all utility conditions and elevations prior to work. Before construction starts, all utility companies, public and private, shall be contacted, including those in control of utilities not shown on this plan. Contact "DIG SAFE" 1-888-344-7233. Report all discrepancies in writing to the Owner Representative and the Owner and receive written instructions prior to proceeding.

1.07 MANNER OF CONDUCTING THE WORK

A. The work shall be conducted with prime consideration given to the following:

1. Compliance with Americans with Disabilities Act requirements.
2. Compliance with governing laws and building codes.
3. Safety, protection, and convenience of the public and workmen.
4. Protection of the existing building structures, materials and finishes to remain from damage.
5. Minimization of dirt and dust proliferation.
6. Avoidance of any damage to existing wetland vegetation to remain.

B. All work shall be done in accordance with the governing laws and building codes and all necessary permits required for the Site Improvement work shall be procured by the Contractor.

1.08 DELIVERY, HANDLING AND STORAGE

A. Deliver materials in original sealed containers marked with name of manufacturer and identification of contents. Store materials under waterproof covers on planking clear of ground and protect from handling damage, dirt, stain, water and wind.

B. Take all necessary precautions to prevent all items from damage during transportation of these materials to the project, unloading and storage on site. Damaged items will not be allowed to be installed and should any damaged items by found in erected work, such items shall be removed immediately and replaced with new items, and the Contractor shall assume all expenses incurred therefrom.

C. Stored materials shall be adequately protected against moisture by (1) staking in such a manner as to allow a complete circulation of air under each stack, and (2) covering each stack, top and sides with a waterproof paper or membrane. Coverings shall remain in place at all times, when not working from the particular stack.

D. Storage shall be secured by Contractor. The Owner will not pay for stored materials until they are incorporated into the work.

1.09 QUALIFICATIONS

A. The Site Improvements shall be performed by a firm or firms having a minimum of five (5) years experience in the installation of materials specified, herein, on projects comparable to this subject and who employs experienced workmen under the supervision of a qualified foreman with a minimum of five (5) years of experience.

PART 2 - PRODUCTS

2.01 CONCRETE SEGMENTAL WALL SYSTEM

A. Concrete masonry units shall be Fat Face segmented wall system with Ancestral Cap by Ideal Concrete Block.

MANUFACTURER Ideal Concrete Block
45-55 Power Road, Westford, MA 07886
232 Lexington Street, Waltham, MA 02452
www.Idealblock.com

Local salesperson Judy True, JTrue@IdealConcreteBlock.com 978-805-8024.

1. Fat Face concrete block color is Quarry Blend
2. One square block with split face finish
3. Open-core design for interlocking one course to the next with rock to rock connection
4. Reversible alignment plug creates vertical walls to height shown in plans
5. Dimensions: Fat Face interlocking blocs 18” long X 11 1/2” deep X 8 “ high. deep

B. Ideal concrete masonry Ancestral cap
1. Ancestral cap color is Quarry Blend
2. Dimensions: 3/63“ high X 16/13 “ long X 13” deep- 2 piece set
3. Matching double sided split finish
4. Chamfered edges on top and sides

C. Base material for standard retaining walls shall be compacted gravel as specified.

2.02 GEOTEXTILE

A. Geotextile, made from pure coir drawn from the husk of coconut, shall be wrapped around the perforated PVC pipe drain to keep it from clogging.

B. Geotextile shall also be applied as shown in the details.

PART 3 - EXECUTION

3.01 CONCRETE MASONRY RETAINING WALLS

A. Construct concrete masonry retaining walls using geotextile filter fabric wrap with perforated PVC pipe drainage as shown on the Drawings and in conformance with manufacturer's instructions.

B. All masonry shall be laid by skilled workmen under adequate supervision, and shall be laid true to lines and levels with joints of uniform thickness, all surfaces true, and corners straight and plumb to specified tolerance.

C. Cut masonry units using motor-driven saws to provide clean, sharp, unchipped cut units as required to provide pattern shown and to fit adjoining work neatly.

- END OF SECTION -

SECTION 32 33 00 – SITE FURNISHINGS

PART 1 - GENERAL

1.1 REFERENCES

A. The General Documents, as listed on the Table of Contents, and applicable parts of Division 1, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.

B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.2 SCOPE

A. The work of this Section consists of all Site Improvement work and related items as indicated on the Drawings and/or specified herein and includes, but is not limited to, the following:

1. Trash receptacles
2. Benches / seating

1.3 RELATED WORK

A. Examine all Drawings and all other Sections of the Specifications for requirements affecting the work described below.
1. Section 32 13 13 – Concrete Paving

1.4 SUBMITTALS

A. Request for Deviations from the Specifications: If any deviations from the specifications are proposed, include written description and reasons for deviations.

B. Shop Drawings: Prior to ordering the below listed materials, submit Shop Drawings and/or product literature to Owner Representative for approval as follows:

1. Coordinated Shop Drawings shall show required sizes, dimensions, sections, profiles of units, the arrangement of and provision for jointing, anchoring, fastening, and supports, and other necessary details for delivery and lifting devices and reception or installation of other work.
2. Do not order materials until Owner Representative's approval has been obtained.
   a. Benches and seating—Shop Drawings and product literature
   b. Trash receptacles—Shop Drawings and product literature
   c. Non-shrinking epoxy grout—Product literature

1.5 QUALITY ASSURANCE

A. Source Limitations: Provide products of the same kind, from a single source.

B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project; the product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT HANDLING AND STORAGE

A. Deliver materials in original sealed containers marked with name of manufacturer and identification of contents. Store materials under waterproof covers on planking clear of ground and protect from handling damage, dirt, stain, water and wind.

B. Take all necessary precautions to prevent all items from chipping, cracking, or other damage during the transportation of these materials to the project, unloading and storage on the site. If required, use wood rollers and provide cushion at end of wood slides. Damaged items shall not be installed, and should any damaged items be found in constructed work, such items shall be removed immediately and replaced, and the Contractor shall assume all expenses incurred therefrom.

C. Stored materials shall be adequately protected against moisture by (1) stacking in such a manner as to allow a complete circulation of air under each stack, and (2) covering each stack, top and sides with a waterproof paper or membrane. Coverings shall remain in place at all times, when not working from the particular stack.

1.7 EXAMINATION OF CONDITIONS

A. The Contractor shall fully inform himself/herself of existing conditions of the site and shall be fully responsible for carrying out all work required to execute the work of the Contract fully and properly, regardless of the conditions encountered in the actual work. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed.

B. The Contractor shall be solely responsible for judging the potential need for storing materials temporarily and/or re-handling items prior to final installation.

1.8 STANDARDS

A. Except as modified by governing code and by the Contract Documents, comply with applicable provisions and recommendations of the following:

1. NHDOT Standard Specifications for Road and Bridge Construction, latest edition
2. AASHTO: American Association of State Highway and Transportation Officials, latest edition
3. ASTM: American Society for Testing and Materials, latest edition.
4. ADA: Americans with Disabilities Act, latest edition

1.9 QUALIFICATIONS

A. Site improvement work shall be assigned to experienced and qualified subcontractors with a minimum of five years experience employing experienced workmen who will work under the full-time supervision of a qualified foreman with a minimum of five years of experience on projects comparable to this project.

1.10 ACCESSIBILITY CODES AND BUILDING CODES

A. From time to time there are changes made in the Federal and /or State accessibility and building codes or it is determined that different codes are applicable to a site. Such determinations or changes may occur during the course of the construction of this

project. If changes become necessary to meet codes a change order shall be issued by the City to cover statutory requirements.

PART 2 – PRODUCTS

2.1 TRASH RECEPTACLES

A. Trash receptacle shall be the style of Parc Vue single use, with side openings as manufactured by Landscape Forms, Inc. 431 Lawndale Avenue Kalamazoo, MI 49048, (800)-521-2546 also (269)-381-0396, or approved an equal in the sizes as shown on the Shop Drawings. Local Landscape Forms salesperson is Nadine Worth, nadenew@landscapeforms.com.

1. The dimensions for the side opening receptacle measure 2'-6" in the outer diameter, the receptacle is 4'-9" tall. Holds 30 gallons.
2. Lid: side opening, color black or as approved by the Owner Representative.
3. All mounting hardware shall be stainless steel conforming to AISI Type 304 and ASTM A193 latest requirements, sizes as shown on the drawings.
4. Liner: 30-gallon polyethylene, color black or as approved by the Resident Engineer.
5. Recycled Material Content: Minimum 25 percent.
   Post-Consumer Material Content: Minimum 9 percent.
   Pre-Consumer Material Content: Minimum 15 percent.
   Recyclable: 100 percent.

B. Contractor shall provide all hardware, plastic liners, leveling legs and anchoring hardware as required for installation and in accordance with approved Shop Drawings. All hardware shall be stainless steel conforming to AISI Type 304 and ASTM A193 requirements.

C. Materials used in the fabrication of the waste receptacles shall meet the following ASTM, ISO and LFI standards:

1. ASTM B 117 – Standard Practice for Operating Salt Spray (Fog) Apparatus
2. ASTM D 522 – Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings
3. ASTM D 523 – Standard Test Method for Specular Gloss
4. ASTM D 2247 – Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity
5. ASTM D 2794 – Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
6. ASTM D 3359 – Standard Test Methods for Measuring Adhesion by Tape Test
7. ASTM D 3363 – Standard Test Method for Film Hardness by Pencil Test
8. ASTM G 155 – Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials
9. ISO 1520 – Paints and Varnishes – Cupping Test
10. ISO 2815 – Paints and Varnishes – Buchholz Indentation Test
11. LFI PT-019 – Standard Test for Strength and Durability

D. The receptacle shall be surface mounted. All mounting hardware shall be stainless steel conforming to ANSI Type 304 and ASTM A193 latest requirements, sizes as shown on the Drawings. Anchor bolts and carriage bolts shall be grouted in with threads down. All exposed bolts shall be painted to match castings.

E. All metal parts of trash and litter receptacles shall be finished using the Pangard II® finishing process or approved equal. The finish shall include a rust inhibitor and top-coat finish of thermosetting polyester powder coat that is UV, chip and flake resistant. Manufacturer shall provide touch-up paint to match factory finish.

F. Grout shall be non-shrinking, non-metallic, non-staining, such as Hallenite "Por-Rok," Sonneborn "Sonogrout," Penn Dixie or Master Builders or approved equal.

G. Concrete for footings shall be 4,000 psi 28-day air entrained concrete as specified in the NHDOT Standard Specifications for Road and Bridge Construction, latest edition.

H. Processed gravel fill shall be as specified in the NHDOT Standard Specifications for Road and Bridge Construction, latest edition.

2.2 BENCHES / SEATING

A. Double Wide Benches shall be the style of the EP 15004-BN, a custom backless bench with no center arm and of black powder coated steel and Ipe wood slats as manufactured by Equiparc 1001 Rue James-Brodie, Saint-Jean-sur-Richelieu, QC J2x0c1, Canada, (450)-346-1882, or approved equal. Local sales person is Jacinthe (Jackie) Dion, jdion@equiparc.com .

i. The dimensions are an overall length of 119 ¾", The depth is 30" deep, with an overall height of 17 15/32".

ii. Wood seat panels, Ipe, as specified: Solid stock wood boards with eased edges. See manufacturers specifications for finish details.

iii. Structure: powder coated steel; color is black

iv. Steel seat panels, black powder coated steel, as specified: See manufacturers specifications for finish details.

v. Structure: powder coated steel; color is black

B. Contractor shall provide all hardware and anchoring hardware as required for installation and in accordance with approved Shop Drawings. All hardware shall be stainless steel conforming to ANISI Type 304 and ASTM A193 requirements.

C. All metal parts of bench shall be finished using the Pangard II® finishing process or approved equal. The finish shall include a rust inhibitor and top-coat finish of thermosetting polyester powder coat that is UV, chip and flake resistant. Manufacturer shall provide touch-up paint to match factory finish.

D. Benches shall be surface mounted. All mounting hardware shall be stainless steel conforming to ANSI Type 304 and ASTM A193 latest requirements, sizes as shown on the Drawings. Anchor bolts and carriage bolts shall be grouted in with threads down. All exposed bolts shall be painted to match castings

E. Grout shall be non-shrinking, non-metallic, non-staining, such as Hallenite "Por-Rok," Sonneborn "Sonogrout," Penn Dixie or Master Builders, or an approved equal.

F. Concrete for footings shall be 4,000 psi 28-day air entrained concrete as specified in the NHDOT Standard Specifications for Road and Bridge Construction, latest edition.

G. Processed gravel fill shall be as specified in the NHDOT Standard Specifications for Road and Bridge Construction, latest edition.

PART 3 - EXECUTION

3.1 TRASH RECEPTACLES

A. Locate and install trash receptacle, complete, in location shown on the Drawings in accordance with manufacturer's written instructions and in accordance with approved Shop Drawings. Placement and height relationship shall be approved by the Owner Representative.

B. The Contractor shall be responsible for timing the delivery of receptacles so as to minimize on-site storage time prior to installation. All stored materials and items must be protected from weather, careless handling, or vandalism

C. Workmanship and finish shall be equal to the best practice of modern shops for each item of work. Exposed surfaces shall have smooth finish and sharp, well-defined lines and arises. Sections shall be well formed to shape and size with sharp lines and angles; curved work shall be sprung evenly to curves. Castings shall have sharp corners and edges, and shall be clean, smooth, and true to pattern.

D. All fabrication shall be accomplished using the highest standards of workmanship. Individual steel pieces shall be saw cut and carefully fit together. All connections shall be secured and flush. All fabricated items shall be fine sanded throughout to produce a high standard of surface smoothness. All surfaces and connections shall be without visible grinding marks, surface differentiation or variation.

E. Provide stainless steel anchors, supports, fasteners and other attachments shown, specified or necessary to secure work in place in accordance with the very best practices. Shim and adjust grate and frame as required for to achieve a flush condition with surrounding pavement or curb. Completely fill holes, slots and other sinkages for anchors, dowels, fasteners and supports with non-shrinking epoxy grout.

F. Touch-up and Repair: For damaged surfaces, bolted connections and abraded areas.
   1. At factory-primed or factory-finished surfaces, touch up finish in conformance with coating manufacturer’s recommendations. Provide touch-up such that repair is not visible from a distance of 6 feet.

G. Protection: Protect materials, fabrications, and assemblies with metal coatings form damage during construction using methods approved by fabricator, galvanizer and coating manufacturer.

3.2 BENCHES / SEATING

A. Locate and install benches, complete, in locations shown on the Drawings in accordance with manufacturer's written instructions and in accordance with approved Shop Drawings. Placement and height relationship shall be approved by the Owner Representative.

B. The Contractor shall be responsible for timing the delivery of benches so as to minimize on-site storage time prior to installation. All stored materials and items must be protected from weather, careless handling, or vandalism.

C. Workmanship and finish shall be equal to the best practice of modern shops for each item of work. Exposed surfaces shall have smooth finish and sharp, well-defined lines and rises. Sections shall be well formed to shape and size with sharp lines and angles; curved work shall be sprung evenly to curves. Castings shall have sharp corners and edges, and shall be clean, smooth, and true to pattern.

D. All fabrication shall be accomplished using the highest standards of workmanship. Individual steel pieces shall be saw cut and carefully fit together. All connections shall be secured and flush. All fabricated items shall be fine sanded throughout to produce a high standard of surface smoothness. All surfaces and connections shall be without visible grinding marks, surface differentiation or variation.

E. Provide stainless steel anchors, supports, fasteners and other attachments shown, specified or necessary to secure work in place in accordance with the very best practices. Shim and adjust grate and frame as required for to achieve a flush condition with surrounding pavement or curb. Completely fill holes, slots and other sink depressions for anchors, dowels, fasteners and supports with non-shrinking epoxy grout.

F. Touch-up and Repair: For damaged surfaces, bolted connections and abraded areas.
   1. At factory-primed or factory-finished surfaces, touch up finish in conformance with coating manufacturer's recommendations. Provide touch-up such that repair is not visible from a distance of 6 feet.

G. Protection: Protect materials, fabrications and assemblies with metal coatings form damage during construction using methods approved by fabricator, galvanizer and coating manufacturer.

END OF SECTION

SECTION 32 39 13 - MANUFACTURED METAL BOLLARDS

PART 1 - GENERAL

1.1 REFERENCES

A. The General Documents, as listed on the Table of Contents, and applicable parts of Division 1, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.

B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.2 SCOPE

A. The work of this Section consists of all Site Improvement work and related items as indicated on the Drawings and/or specified herein and includes, but is not limited to, the following:

1. Unlighted Embedded Bollard
2. Lighted Embedded Bollard

1.3 RELATED WORK

A. Examine all Drawings and all other Sections of the Specifications for requirements affecting the work described below.

1.4 SUBMITTALS

A. Request for Deviations from the Specifications: If any deviations from the specifications are proposed, include written description and reasons for deviations.

B. Shop Drawings: Prior to ordering the below listed materials, submit Shop Drawings and/or product literature to Owner Representative for approval as follows:

1. Coordinated Shop Drawings shall show required sizes, dimensions, sections, profiles of units, the arrangement of and provision for jointing, anchoring, fastening, and supports, and other necessary details for delivery and lifting devices and reception or installation of other work.
2. Show in large scale details any unique fabrication and setting requirements for wall veneers, caps, bases, special wall end conditions, or any other specified areas seen as necessary or as directed by the Owner Representative.
3. Do not order materials until Owner Representative’s approval has been obtained.

    a. Lighted and Unlighted Bollards – Product literature with specified elements highlighted

1.5 QUALITY ASSURANCE

A. Source Limitations: Provide products of the same kind, from a single source.

B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project; the product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT HANDLING AND STORAGE

A. Deliver materials in original sealed containers marked with name of manufacturer and identification of contents. Store materials under waterproof covers on planking clear of ground and protect from handling damage, dirt, stain, water and wind.

B. Take all necessary precautions to prevent all items from chipping, cracking, or other damage during the transportation of these materials to the project, unloading and storage on the site. Do not use pinch or wrecking bars without protecting edges of stone, concrete masonry units, and brick with wood or other rigid materials. Lift with wide-belt type slings or vacuum lifts wherever possible; do not use wire rope or ropes containing tar or other substances that might cause staining. If required, use wood rollers and provide cushion at end of wood slides. Damaged items shall not be installed, and should any damaged items be found in constructed work, such items shall be removed immediately and replaced, and the Contractor shall assume all expenses incurred therefrom.

C. Stored materials shall be adequately protected against moisture by (1) stacking in such a manner as to allow a complete circulation of air under each stack, and (2) covering each stack, top and sides with a waterproof paper or membrane. Coverings shall remain in place always, when not working from the stack.

1.7 EXAMINATION OF CONDITIONS

A. The Contractor shall fully inform himself/herself of existing conditions of the site and shall be fully responsible for carrying out all work required to fully and properly execute the work of the Contract, regardless of the conditions encountered in the actual work. No claim for extra compensation or extension of time will be allowed because of actual conditions inconsistent with those assumed.

B. The Contractor shall be solely responsible for judging the potential need for storing materials temporarily and/or re-handling items prior to final installation.

C. All areas to be irrigated shall be inspected by the Contractor before starting work and any defects, such as incorrect grading, drainage problems etc., shall be reported to the Owner Representative prior to beginning the work. The commencement of work by the Contractor shall indicate the Contractor's acceptance of the areas to be irrigated, and the Contractor shall assume full responsibility for the work of this Section.

D. The Contractor shall be solely responsible for judging the full extent of work requirements involved, including but not limited to the potential need for storing materials temporarily and/or re-handling items prior to final installation.

E. Contractor shall verify all utility conditions and elevations prior to work. Before construction starts, all utility companies, public and private, must be contacted, including those in control of utilities not shown on this plan. The Contractor shall contact "DIG SAFE" 811 well in advance of beginning work to allow for the accurate identification of utilities. The Contractor shall report any discrepancies in writing to the General Contractor and/or Owner Representative and receive written instructions prior to proceeding.

1.8 STANDARDS

A. Except as modified by governing code and by the Contract Documents, comply with applicable provisions and recommendations of the following:

1. NHDOT Standard Specifications, latest edition
2. AASHTO: American Association of State Highway and Transportation Officials, latest edition
4. ADA: Americans with Disabilities Act, latest edition

1.9 QUALIFICATIONS

A. Site improvement work shall be assigned to experienced and qualified subcontractors with a minimum of five years' experience employing experienced workmen who will work under the full-time supervision of a qualified foreman with a minimum of five years of experience on projects comparable to this project. Submit references for subcontractors for approval of Owner Representative.

1.10 ACCESSIBILITY CODES AND BUILDING CODES

A. From time to time there are changes made in the Federal and /or State accessibility and building codes or it is determined that different codes are applicable to a site. Such determinations or changes may occur during the course of the construction of this project. If changes become necessary to meet codes a change order shall be issued by the Owner to cover statutory requirements.

PART 2 - PRODUCTS

2.1 EMBEDDED UNLIGHTED BOLLARD

A. Bollard shall be the style of round Silhouette as manufactured by StressCrete Group, 9200 Energy Lane Northport, Alabama 35476-3442 (205) 339-0711 www.scgroup.com or approved an equal in the sizes as shown on the Shop Drawings. Local sales person Peter Bean peter@speclines.net.

1. The dimensions for the unlighted bollard measure 42" tall above ground with an 8" diameter.
2. King nonlighted bollard
3. Structural type Aluminum
4. Silhouette round3 model
5. Color black
6. Direct bury embedded

B. Contractor shall provide all hardware as required for installation and in accordance with approved Shop Drawings. All hardware shall be stainless steel conforming to AISI Type 304 and ASTM A193 requirements.

2.2 EMBEDDED LIGHTED BOLLARD

A. Bollard shall be the style of round Silhouette as manufactured by StressCrete Group, 9200 Energy Lane Northport, Alabama 35476-3442 (205) 339-0711 www.scgroup.com or approved an equal in the sizes as shown on the Shop Drawings. Local lighting salesperson, Peter Beane peter@speclines.net.

1. The dimensions for the lighted bollard measure 42” tall above ground with an 8” diameter.
2. King lighted bollard
3. Socket size LED
4. Wattage varies according to bollard location: entry plaza 25w, amphitheater 40w
5. Voltage line 120
6. Structural type Aluminum
7. Model Silhouette round3
8. Color black
9. Direct bury embedded
10. Electrical conduit runs directly through reinforced base.

B. Contractor shall provide all hardware for installation and in accordance with approved Shop Drawings. All hardware shall be stainless steel conforming to AISI Type 304 and ASTM A193 requirements.

PART 3 - EXECUTION

A. Locate and install Bollards, complete, in locations shown on the Drawings in accordance with manufacturer's written instructions and in accordance with approved Shop Drawings. Placement and height relationship shall be approved by the Owner Representative.

B. The Contractor shall be responsible for timing the delivery of bollards so as to minimize on-site storage time prior to installation. All stored materials and items must be protected from weather, careless handling or vandalism.

C. Workmanship and finish shall be equal to the best practice of modern shops for each item of work. Exposed surfaces shall have smooth finish and sharp, well defined lines and rises. Sections shall be well formed to shape and size with sharp lines and angles; curved work shall be sprung evenly to curves. Castings shall have sharp corners and edges, and shall be clean, smooth, and true to pattern.

D. All fabrication shall be accomplished using the highest standards of workmanship. Individual steel pieces shall be saw cut and carefully fit together. All connections shall be secured and flush. All fabricated items shall be fine sanded throughout to produce a high standard of surface smoothness. All surfaces and connections shall be without visible grinding marks, surface differentiation or variation.

E. Provide stainless steel anchors, supports, fasteners and other attachments shown, specified or necessary to secure work in place in accordance with the very best practices. Shim and adjust grate and frame as required for to achieve a flush condition with surrounding pavement or curb. Completely fill holes, slots and other sink depressions for anchors, dowels, fasteners and supports with non-shrinking epoxy grout.

F. Touch-up and Repair: For damaged surfaces, bolted connections and abraded areas.
   1. At factory-primed or factory-finished surfaces, touch up finish in conformance with coating manufacturer’s recommendations. Provide touch-up such that repair is not visible from a distance of 6 feet.

G. Protection: Protect materials, fabrications and assemblies with metal coatings form damage during construction using methods approved by fabricator, galvanizer and coating manufacturer.

H. Illumination assemblies shall be fabricated and installed in accordance with this specification and the details and dimensions shown on the plans or approved in writing by the Owner Representative. Illumination assemblies shall be located as shown on the plans, except that the Owner Representative may shift the assembly locations when necessary to secure a more desirable location or to avoid conflicts with utilities.

I. Unless otherwise shown on the plans, the Contractor shall do all staking and the Owner Representative will verify and approve all illumination assembly locations.

J. Erection of the bollard luminaires located near any overhead or underground utilities shall be accomplished using established industry and utility safety practices. The Contractor shall consult with the appropriate utility company prior to beginning such work.

END OF SECTION

SECTION 32 91 00 – PLANTING SOIL

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: Labor, materials, tools, supplies, equipment, facilities, transportation and services necessary for, and incidental to performing all operations in connection with furnishing, and delivery of planting soils on the Plans and Details, in locations where the standard planting mix is not being used.

B. The scope of Work in this Section includes, but is not limited to, the following:
Locate, purchase, deliver, and install imported planting soil and soil amendments.
1. Unscreened Planting Soil Mix
2. Screened Loam
3. Bioretention Soil Mix

C. Related Requirements: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division I Specifications, apply to Work of this Section.

1. Section 32 93 00 – Plants
2. Section 32 92 00 – Turf and Grasses

1.02 REFERENCES

A. Definitions:

1. COMPACTION: The density of soil measured as oven dry weight divided by volume.
2. EXISTING SOIL: Mineral soil existing at the locations of proposed planting of area designated for the installation
3. Owner Representative: The person or entity, employed by the Owner to represent their interest in the review of the Work.
4. PED: Clump or clod of soil held together by a combination of clay, organic matter, and fungal hyphae, retaining the original structure of the harvested soil.
5. SCREENED SOIL: Soil that has been processed through a metal screen to remove or break apart soil peds (clumps /clods), roots, rocks and debris and remove larger physical items in the soil not permitted by the specification.
6. SUBGRADE: Surface or elevation of subsoil remaining after completing excavation, or top surface of fill or backfill, before placing planting soil.

B. Reference Standards:

1. ASTM International (ASTM)
a. ASTM C33, Standard Specification for Concrete Aggregates- Fine Aggregates.

2. The Soil Science Society of America.
a. Methods of Soil Analysis, most current edition,

3. United States Composting Council *www.compostingcouncil.org and* http://compostingcouncil.org/admin/wp-content/plugins/wp-*pdfupload/pdf/191/LandscapeArch Specs.pdf.*

4. United States Department of Agriculture, Natural Resources Conservation Service
a. National Soil Survey Handbook, title 430-VI. http://www.nres.usda.gov/wps/portal/nrcs/detail/soils/survey/?cid=nres142p2 054242

1.03 SUBMITTALS

A. Action Submittals: Submit these to the Owner Representative for review and acceptance not less than 8 weeks prior to start of installation of materials and products specified in this Section.

1. Product Data: For each type of product, submit manufacturer's product literature with technical data sufficient to demonstrate that the product meets these specifications.

a. For each compost product submit the manufactures certification that the compost meets the requirements for US Compost Council STNTMECC criteria for "Compost as a Landscape Backfill Mix Component" and other requirements of the Specification.

b. For coarse sand product submit the following analysis by a recognized laboratory:

1) pH

2) Manufactures Fines Modulus Index Particle size distribution (percent passing the following sieve sizes):

3/8inch	(9.5 mm)
No 4	(4.75 mm)
No 8	(2.36 mm)
No 16	(1.18mm)
No 30	(0.60 mm)
No 50	(0.30 mm)
No 100	(0.15 mm)
No 200	(0.075 mm)

B. Test and Evaluation Reports:

1. Include analysis of bulk materials including soils and aggregates, by a recognized laboratory that demonstrates that the materials meet the Specification requirements.
2. Submit required soil test analysis report for each sample of imported topsoil, existing site soil, and planting soil mixes from an approved soil-testing laboratory as follows:
    a. Do not submit planting soil mixes, for testing until all topsoil, compost, and coarse sand have been approved.
    b. If tests fail to meet the Specifications, obtain other sources of material, retest and resubmit until accepted by the Owner Representative.
    c. All testing shall be performed following the requirements of *Methods of Soil Analysis,* The Soil Science Society of America.
    d. Provide a particle size analysis (percent dry weight) and USDA soil texture analysis. Soil testing of planting soil mixes shall also include USDA gradation distribution of gravel, coarse sand, medium sand, and fine sand in addition to silt and clay. Reports of particle size distribution shall use USDA size nomenclature and analysis protocols.
        i. Provide the following other soil properties:
        i. pH and buffer pH
        ii. Percent organic content by oven dried weight.
        iii. Nutrient levels by parts per million including: phosphorus, potassium, magnesium, manganese, iron, zinc and calcium. Nutrient test shall include the testing laboratory recommendations for supplemental additions to the soil for optimum growth of the plantings specified.
        iv. Soluble salt by electrical conductivity of a 1:2 soil water sample measured in Milliohm per cm.

C. All soil testing will be at the expense of the Contractor. Samples:

1. Each sample shall be double bagged packaged in two plastic zip lac style bags. Each bag shall be clearly marked with the project name, date, contractors name and telephone number, and product name.
2. Samples shall be submitted at the same time as the particle size and physical analysis of materials.

3. Samples of the existing site soil that are under existing pavement to be removed may be submitted as soon as possible after the paving is removed.
4. Samples will be reviewed for appearance only.
5. Provide samples for the following products.
   a. One-gallon sample of each type of existing site soil prior to adding amendments.
   b. One-gallon sample of imported topsoil.
   c. One-gallon sample of compost.
   d. One-gallon sample of coarse sand.
   e. One-gallon sample of unscreened planting soil mix.
   f. One gallon sample of screened loam.
   g. One-gallon sample of bio-retention soil mix.
   h. One-gallon sample of wood chips.

1.04 QUALITY ASSURANCE

A. Supplier: Soil mixes shall be supplied by a firm that specializes in the production of mixes of planting soils and have at least 5 years of experience in providing soil mixes soils to projects of similar size and scope to this Work.

1. Qualification Statements:

a. Soil supplier: Submit documentation of the qualifications of the planting soil supplier and their field supervisor, sufficient to demonstrate that both meet the requirements specified in QUALITY ASSURANCE. The contractor shall take ever effort to source all project topsoil, compost, and sand from this single supplier.

B. Soil Testing Laboratory Qualifications: The testing laboratory shall specialize in agricultural soil testing and be a member of the Soil Science Society of America's, North American Proficiency Testing Program (NAPT). Testing results for soil particle size shall be reported using USDA sizes for sand, silt, and clay.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Weather: Do not mix or deliver soil when frozen or muddy.

B. Protect soil and soil stockpiles, from wind, rain and washing that can erode soil or separate fines and coarse material, and contamination by chemicals, dust and debris that may be detrimental to plants or soil drainage. Confine delivered materials to neat piles in areas coordinated with the site supervisor. Cover stockpiles with plastic sheeting or fabric at the end of each Workday.

C. All manufactured packaged products and material shall be delivered to the site in unopened containers and stored in a dry enclosed space suitable for the material and meeting all environmental regulations.

1. Biological and chemical additives shall be protected from extreme humidity, cold, or heat. All products shall be freshly manufactured and dated for the year in which the products are to be used. Chemical amendments shall have original labels intact and legible, stating the guaranteed chemical analysis.

PART 2 PRODUCTS

2.01 TOPSOIL

A. Imported topsoil: Fertile, friable soil loam topsoil suitable for the germination of seeds and the support of vegetative growth meeting the following criteria:

1. Soil texture: USDA loam, sandy clay loam or sandy loam with clay content between 15 and 35 percent; a combined clay/silt content of no more than 60 percent; and sand no more than 52 percent.

2. Except where noted, imported topsoil shall NOT have been screened and shall retain soil peds (clumps/clods) larger than 2 inches (50 mm) in diameter throughout the stockpile after harvesting.
   a. Light screening through a 2-inch (50 mm) square or larger opening will be permissible in soils with clay content of 20 percent or greater if required to break up large peds (clumps/clods) or remove coarse roots and stones.
   b. Retained soil peds (clumps/clods) shall be the same color on the inside as is visible on the outside surface of the ped.
3. Soil objects larger than 1/4 inch (6.24 mm) in diameter: Imported topsoil shall contain less than 5 percent total volume of the combination of all objects 1 to 8 inch (25 mm to 200 mm) in their largest dimension including clumps/clods of heavy clay, sandy clay or silty clay subsoil, debris, refuse, roots, stones, sticks, brush, and or litter. The soil shall contain less than 8 percent by volume total of the above objects 1/4 inch to 1 inch (6.24 mm to 25 mm) in diameter. Remove all objects larger than 8 inch (200 mm) in its longest dimension.
   a. Meet the above requirement by utilizing acceptable soils sources rather than soil screening.
7. Imported topsoil may be a harvested soil from fields or development sites or purchased from suppliers who collect and process soil. The organic content and particle size distribution shall be the result of natural soil formation. Manufactured soils where sand, composted organic material or other additives have been added to the soil to meet the requirements of imported topsoil shall not be acceptable. pH value shall be between 5.0 and 7.0. Percent Organic Matter (OM): 3 to 5 percent, by dry weight. Soluble Salt Level: Less than 2 mmho/cm.

4. Soil nutrient chemistry suitable for growing the plants specified or after modification.
5. Germinating seedlings from seeds in the soil shall be removed within one month of germination whether during the period the soil is being stored or after installation, including during the warranty period of the plants.

B. Stockpiled existing topsoil at the site meeting the above criteria may be acceptable.

C. Submittal Requirements: Provide a one-gallon sample from each imported topsoil source with required soil testing results. The sample shall be a mixture of the random samples taken around the source stockpile or field. The soil sample shall be delivered with soil peds (clumps/clods) intact that represent the size and quantity of expected peds(clumps/clods) in the final delivered soil. The sample shall represent the expected amount of objects larger than 1/4 inch (6.24 mm).

2.02 COMPOST

A. Compost: Blended and ground leaf, wood and other plant-based material, composted for a minimum of 9 months and at temperatures sufficient to break down woody fibers, seeds and leaf structures, free of toxic material at levels that are harmful to plants or humans. Compost feed stock shall be yard waste trimmings, blended with other plant and or manure feed stock designed to produce compost high in fungal material.

1. Compost shall be commercially prepared compost and meet US Compost Council STA/TMECC criteria or as modified in this Section for "Compost as a Landscape Backfill Mix Component".
   http://compostingcouncil.org/admin/wp-content/plugins/wp- pdfupload/pdf191/LandscapeArch Specs.pdf
2. Submittal Requirements: Provide one-gallon sample with manufacturer's literature and material certification that the product meets the requirements.

2.03 COARSE SAND

A. Clean, washed, sand, free of toxic materials
   1. Coarse concrete sand, ASTM C-33 Fine Aggregate, with a Fines Modulus Index of 2.8 and 3.2.
   2. Coarse Sands shall be clean, sharp, natural Coarse Sands free of limestone, shale and slate particles. Manufactured Coarse Sand shall not be permitted.
   3. pH shall be lower than 7.0.
   4. Provide Coarse Sand with the following particle size distribution:

Sieve	Percent passing
3/8 inch (9.5 mm)	100
No 4 (4.75 mm)	95-100
No 8 (2.36 mm)	80-100
No 16 (1.18 mm)	50-85
No 30 (.60 mm)	25-60
No 50 (.30 mm)	10-30
No 100 (.15 mm)	2-10
No 200 (0.75 mm	2-5

B. Provide a gallon sample with manufacturer's literature and material certification that the product meets the requirements.

2.04 FERTILIZER

A. If noted by the soil test recommendations, add slow-release, organic fertilizer based on soil test and plant requirements.

B. Fertilizer shall be M-Roots® or equal and applied at planting time for trees and shrubs. Acid-loving trees and shrubs should be supplemented at initial planting time and once each year as needed with Holly-Tone® or equal.

C. Submittal Requirements: Provide manufacturer's literature that the product meets the requirements.

2.05 LIME

A. ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:
   1. Class: Class T, with a minimum 99 percent passing through No. 8 (2.36-mm) sieve and a minimum 75 percent passing through No. 60 (0.25-mm) sieve.
   2. Provide lime in form of dolomitic limestone.

B. Provide manufacturer's literature and material certification that the product meets the requirements.

2.06 SCREENED LOAM

A. Imported topsoil meeting the criteria for sandy loam can be screened for some applications including project areas being seeded. In the current project, areas that shall be dressed with screened loam for seeding include:
   1. Lawns (seeded, sodded, or reinformed turf)

B. Screened loam shall be a "sandy loam" determined by based on the USDA Textural Classification:

Material	%
Sand	less than 52%
Silt	28%-50%
Clay	7%-27%

Soil test shall include breakdown of sands from coarse to very fine.

C. Loam shall be a "sandy loam" as determined by mechanical analysis (ASTM D- 422) conforming to the following grain size distribution:

U.S Sieve No. Percent Passing by Weight	Maximum	Minimum
4	100	100
10	95	90
40	85	60
100	60	38
200	35	22
0.002 mm	5	0

Maximum grain size shall be one and one-quarter inches largest dimension. The maximum retained on the one-quarter inch sieve shall be 20 percent by weight of the total sample. Test shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.

D. Screened loam shall be uncontaminated by salt, water, foreign matter and substances harmful to plant growth. The electrical conductivity (EC2) of a 1:2 soil-water suspension shall be equal to or less than 1.0 milliohms/cm. (Test material passing #4 Sieve).

E. Screened loam shall have an acidity range of pH 5.5 to pH 7.0 and shall contain not less than 5% nor more than 10% organic matter as determined by the loss on ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 230°F plus or minus 9°F. To adjust organic matter content, the soil may be amended, prior to site delivery, by the addition of compost. Use of organic amendments is acceptable only if random soil sampling indicates thorough incorporation.

F. Screened loam shall have a Cation Exchange Capacity (CEC) of between 10 and 15.

G. All screened loam provided from off-site sources shall be brought to the site meeting all specification requirements. The screened loam must not be handled or moved when in a wet or frozen condition.

H. Topsoil that has been stockpiled on the site, may be used provided it can be made to comply with this Specification and meets the above requirements.

I. To assure screened loam fulfills requirements regarding textural analysis, organic matter content, CEC and pH, soil testing results will be obtained by the Contractor and submitted to the Owner Representative for approval before any soil is delivered to the site.

2.07 PLANTING SOIL MIX

A. The Planting Soil Mix shall be made of a mixture of unscreened imported topsoil, coarse sand, and compost as specified above shall be blended to make a new soil that meets the Project goals for use in several project applications:

1. Planting beds
2. Tree pits

C. For the Planting Soil Mix, the approximate mix ratio of imported topsoil, coarse sand and compost shall be:

Mix component	Percent by moist volume
Imported topsoil unscreened	70 percent
Coarse sand	10 percent
Compost	20 percent

D. Final Tested Soil Organic Matter (OM): 2.75 to 4 percent (by dry weight loss ash burn).

E. Mix the coarse sand and compost together first and then add to the topsoil. Mix with a loader bucket to loosely incorporate the topsoil into the coarse sand/compost Mix. DO NOT OVER MIX. Do not mix with a soil-blending machine. Do not screen the soil. Peds (clumps/clods) of Soil, and loosely mixed Compost and coarse sand will be permitted in the overall mix.

F. At the time of soil installation, add fertilizer or biological amendments, if required, to the planting soil mix at rates recommended by the testing results for the plants to be grown.

G. The Unscreened Planting Soil Mix shall be delivered with soil peds (clumps/clods) intact that represent the size and quantity of expected peds (clumps/clods) in the final delivered soil mix.

2.08 BIORETENTION PLANTING MEDIUM

A. Bioretention planting medium shall be used for plant materials in the bioretention areas only.

B. Bioretention medium shall be the NHDOT recommended mix as specified in the civil drawings.

Part 3 EXECUTION

3.01 SITE EXAMINATION

A. Prior to installation of any soils, examine site to confirm that existing conditions are satisfactory for the work of this section to proceed.

1. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope toward the under-drain lines as shown on the drawings.
2. Confirm that surface all areas to be filled with Planting Soil are free of construction debris, refuse, compressible or biodegradable materials, stones greater than 2 inches diameter, soil crusting films of silt or clay that reduces or stops drainage from the Planting Soil into the subsoil; and/or standing water. Remove unsuitable material from the site.
3. Confirm that no adverse drainage conditions are present.
4. Confirm that no conditions are present which are detrimental to plant growth.
5. Confirm that utility work has been completed per the drawings.
6. Confirm that irrigation work, which is shown to be installed below prepared soil levels, has been completed.

B. If unsatisfactory conditions are encountered, notify the Owner Representative immediately to determine corrective action before proceeding.

3.02 COORDINATION WITH PROJECT WORK

A. The Contractor shall coordinate with all other work that may impact the completion of the work.

B. Prior to the start of work, prepare a detailed schedule of the work for coordination with other

trades.

C. Coordinate the relocation of any irrigation lines, heads or the conduits of other utility lines that are in conflict with tree locations. Root balls shall not be altered to fit around lines. Notify the Owner Representative of any conflicts encountered.

3.03 GRADE AND ELEVATION CONTROL

A. Provide grade and elevation control during installation of Planting Soil. Utilize grade stakes, surveying equipment, and other means and methods to assure that grades and contours conform to the grades indicated on the plans.

3.04 SITE PREPARATION

A. Excavate to the proposed subgrade. Maintain all required angles of repose of the adjacent materials as shown on the drawings or as required by this specification. Do not over excavate compacted subgrades of adjacent pavement or structures. Maintain a supporting 1:1 side slope of compacted subgrade material along the edges of all paving and structures where the bottom of the paving or structure is above the bottom elevation of the excavated planting area.

B. Remove all construction debris and material including any construction materials from the subgrade.

C. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope approximately parallel to the finished grade and/or toward the subsurface drain lines as shown on the drawings.

D. In areas where Planting Soil is to be spread, confirm subgrade has been scarified.

E. Protect adjacent walls, walks and utilities from damage or staining by the soil. Use 1/2 inch plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work.

1. At the end of each working day, clean up any soil or dirt spilled on any paved surface.
2. Any damage to the paving or site features or work shall be repaired at the Contractor’s expense.

3.05 PLANTING SOIL AND PLANTING SOIL MIX INSTALLATION

A. Prior to installing any Planting Soil from stockpiles or Planting Soil Mixes blended off site, the Owner Representative shall approve the condition of the subgrade and the previously installed subgrade preparation and the installation of subsurface drainage.

B. All equipment utilized to install or grade Planting Soils shall be wide track or balloon tire machines rated with a ground pressure of 4 psi or less. All grading and soil delivery equipment shall have buckets equipped with 6-inch-long teeth to scarify any soil that becomes compacted.

C. In areas of soil installation above existing subsoil, scarify the subgrade material prior to installing Planting Soil.

1. Scarify the subsoil of the subgrade to a depth of 3 – 6 inches with the teeth of the back hoe or loader bucket, tiller or other suitable device.
2. Immediately install the Planting Soil. Protect the loosened area from traffic. DO NOT allow the loosened subgrade to become compacted.
3. In the event that the loosened area becomes overly compacted, loosen the area again prior to

installing the Planting Soil.

D. Install the Planting Soil in 12 - 18-inch lifts to the required depths. Apply compacting forces to each lift as required to attain the required compaction. Scarify the top of each lift prior to adding more Planting Soil by dragging the teeth of a loader bucket or backhoe across the soil surface to roughen the surface.

E. Phase work such that equipment to deliver or grade soil does not have to operate over previously installed Planting Soil. Work in rows of lifts the width of the extension of the bucket on the loader. Install all lifts in one row before proceeding to the next. Work out from the furthest part of each bed from the soil delivery point to the edge of the each bed area.

3.06 OVER COMPACTION REDUCTION

A. Any soil that becomes compacted shall be dug up and reinstalled. This requirement includes compaction caused by other sub-contractors after the Planting Soil is installed and approved.

B. Surface roto tilling shall not be considered adequate to reduce over compaction at levels 6 inches or greater below finished grade.

3.07 INSTALLATION OF CHEMICAL ADDITIVES

A. Following the installation of each soil and prior to fine grading and installation of the Compost till layer, apply chemical additives as recommended by the soil test, and appropriate to the soil and specific plants to be installed.

B. Types, application rates and methods of application shall be approved by the Owner Representative prior to any applications.

3.08 FINE GRADING

A. The Owner Representative shall approve all rough grading prior to the installation of Compost, fine grading, planting, and mulching.

B. Grade the finish surface of all planted areas to meet the grades shown on the drawings, allowing the finished grades to remain higher (10 – 15% of depth of soil modification) than the grades on the grading plan, as defined in paragraph Planting Soil Installation, to anticipate settlement over the first year.

C. Utilize hand equipment, small garden tractors with rakes, or small garden tractors with buckets with teeth for fine grading to keep surface rough without further compaction. Do not use the flat bottom of a loader bucket to fine grade, as it will cause the finished grade to become overly smooth and or slightly compressed.

D. Provide for positive drainage from all areas toward the existing inlets, drainage structures and or the edges of planting beds. Adjust grades as directed to reflect actual constructed field conditions of paving, wall and inlet elevations. Notify the Owner Representative in the event that conditions make it impossible to achieve positive drainage.

E. Provide smooth, rounded transitions between slopes of different gradients and direction. Modify the grade so that the finish grade before adding mulch and after settlement is one or two inches below all paving surfaces or as directed by the drawings.

F. Fill all dips and remove any bumps in the overall plane of the slope. The tolerance for dips and bumps in shrub and ground cover planting areas shall be a 2 inch deviation from the plane in 10 feet. The tolerance for dips and bumps in lawn areas shall be a 1 inch deviation from the plane in 10 feet.

3.09 CLEAN UP

A. During installation, keep the site free of trash, pavements clean and work area in an orderly condition at the end of each day. Remove trash and debris in containers from the site at least once weekly.

1. Immediately clean up any spilled or tracked soil, fuel, oil, trash or debris deposited by the Contractor from all surfaces within the project or on public right of ways and neighboring property.

B. Once installation is complete, wash all soil from pavements and other structures. Ensure that mulch is confined to planting beds and that all tags and flagging tape are removed from the site. The Owner Representative seals are to remain on the trees and removed at the end of the warranty period.

1. Make all repairs to grades, ruts, and damage to the work or other work at the site.

2. Remove and dispose of all excess Planting Soil, subsoil, mulch, plants, packaging, and other material brought to the site by the Contractor.

3.10 PLANTING SOIL AND MODIFIED EXISTING SOIL PROTECTION

A. The Contractor shall protect installed and/or modified Planting Soil from damage including contamination and over compaction due to other soil installation, planting operations, and operations by other Contractors or trespassers. Maintain protection during installation until acceptance. Utilize fencing and matting as required or directed to protect the finished soil work.

B. Loosen compacted Planting Soil and replace Planting Soil that has become contaminated as determined by the Owner Representative.

1. Till and restore grades to all soil that has been driven over or compacted during the installation of plants.
2. Where modified existing soil has become contaminated and needs to be replaced, provide imported soil that is of similar composition, depth and density as the soil that was removed.

3.11 PROTECTION DURING CONSTRUCTION

A. The Contractor shall protect planting and related work and other site work from damage due to planting operations, operations by other Contractors or trespassers.

1. Maintain protection during installation until the date of plant acceptance (see specifications section – Planting). Treat, repair or replace damaged work immediately.

B. Damage done by the Contractor, or any of their sub-contractors to existing or installed plants, or any other parts of the work or existing features to remain, including large existing trees, soil, paving, utilities, lighting, irrigation, other finished work and surfaces including those on adjacent property, shall be cleaned, repaired or replaced by the Contractor at no expense to the Owner. The Owner Representative shall determine when such cleaning, replacement or repair is satisfactory. Damage to existing trees shall be assessed by a certified arborist.

3.12 SUBSTANTIAL COMPLETION ACCEPTANCE

A. Upon written notice from the Contractor, the Owner Representative shall review the work and make a determination if the work is substantially complete.

B. The date of substantial completion of the planting soil shall be the date when the Owner Representative accepts that all work in Planting and Planting Soil installation sections is complete.

END OF SECTION

SECTION 32 92 00 TURF AND GRASSES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   A. Safety monitoring & response.
   B. Protection of existing features and work in progress.
   C. Review of the project plans, details, and notes.

B. Related Sections:
   A. Drawings and general provisions of contract, including general and supplementary conditions and Division I specifications, apply to work of this section.
   B. Related Specification Sections
      a. Section 32 93 00 – Plants
      b. Section 32 91 00 – Planting Soils
      c. Section 31 20 00 – Earthwork

1.2 SUBMITTALS

A. Contractor shall be required to submit manufacturer's information and statements of guarantee and/or certifications from vendors who supply seed, mulches, tackifiers, and fertilizers.

B. Contractor shall furnish to Owner's Representative a signed statement certifying that the seed furnished is from a lot that has been tested by a recognized laboratory for seed testing within six (6) months prior to the date of delivery.

C. Contractor shall submit to Owner's Representative the manufacturers guaranteed chemical analysis, name, trade name, trademark, and conformance to state law of all fertilizers and herbicides.

1.3 QUALITY ASSURANCE

A. Conform to applicable City code for environmental requirements, disposal of debris, and use of herbicides.

B. Perform Work in accordance with professional standards, applicable permit conditions, and regulatory requirements.

C. Contractor must be knowledgeable of National Arborist Association standards and have at least 5 years' experience involving this work. Landscaping work shall be assigned to an experienced and qualified landscaping Subcontractor employing experienced workmen under the full-time supervision of a qualified foreman with a minimum of 5 years' experience on projects similar in scale to this one.

1.4 REFERENCES AND STANDARDS

A. References: The following specifications and standards of the organizations and documents listed in this paragraph form a part of the Specification to the extent required by the references thereto.
   A. Association of Official Seed Analysts (AOSA).

1.5 DELIVERY, STORAGE, AND HANDLING

A. All materials shall be furnished in original manufacturers shipping bags or containers and remain in these bags or containers until they are used. All materials shall be stored in a manner that will prevent them from coming into contact with precipitation, surface water, or any other contaminating substance.

B. Any materials that have become wet, moldy, or otherwise damaged in transit or in storage shall not be used.

1.6 MAINTENANCE

A. Maintenance shall begin immediately after lawn seeding and/or sodding and shall continue for a minimum of ninety (90) days and until final written acceptance by the Owner Representative.

B. Maintenance shall begin immediately after seeding of wildflower and bioretention areas and shall continue for twelve (12) months and until final written acceptance by the Owner Representative.

PART 2 PRODUCTS

2.1 WATER

A. Water: clean, fresh, and free of substances or matter that would inhibit vigorous and healthy growth of grass.

B. Contractor shall supply clean water, equipment, methods of transportation, water tanker, hoses, attachments, and other accessories as necessary for all seeding requirements, maintenance and other related work.

C. Most of the areas to be seeded will not have irrigation. However, portions of the project lawn shall be irrigated. The Contractor shall coordinate lawn seeding and/or sod installation with the irrigation Subcontractor.

D. All costs for supply of water incurred during the contract period shall be borne by Contractor.

2.2 FIBER MULCH

A. Hydromulch for Grass Seeds shall be Mat-Blend Plus with Added Tackifier as manufactured by Mat Inc., 12402 Hwy. 2, Floodwood, MN 55736, (888)-477-3028, or approved equal.

   A. Hydromulch shall contain a pre-mixed blend of wood fiber and clean recycled newsprint, plus 3% high-grade organic tackifier. It shall contain a specified range of

fiber lengths, with a minimum of 30% of the fibers averaging 0.15 inches or longer. All matter shall be non-toxic to plant or animal life.

Ingredients	
Wood fiber content	60%-10%
Recycled clean paper content	40%-10%
Tackifier content by weight	3%
Basic green dye	<1%
Trade secret	<1%
Composition	
Organic matter	97%
Inorganic matter (ash) (max.)	3%
Moisture content (total weight base)	12%-3%
pH at 3% consistency in water slurry (avg.)	5.7
Water-holding capacity (min.)	1.2 gal/lb.

1. The wood fiber mulch shall contain no growth or germination-inhibiting factors and shall be colored green with a non-toxic dye to facilitate visual monitoring during application. It shall disperse rapidly in water to form homogenous slurry and remain in such a state when agitated in the hydraulic mulching unit with any other specified and approved materials.

2. The wood fiber mulch and any specified additives, when applied, shall form an absorptive mat, but not a growth inhibiting membrane, to allow moisture, natural or mechanical, to percolate into the underlying soil.

2.3 TACKIFIER

A. Tackifier: non-toxic, water dilutable, liquid dispersion, mulch binder free of growth or germination inhibiting factors.

2.4 SEED

A. Seed shall be that specified or an approved equal.

B. All seed shall be mixed by a wholesale seed supplier to obtain the specified mixture. No species substitutions shall be permitted without prior approval of the Owner's Representative. Reputable seed companies include Ernst Seeds of Meadville, PA, Allen's Seeds of Exeter, RI, and New England Wetland Plants, Amherst, MA.

2.5 SEED MIXES

A. Bioretention Area Seed Mix

Bioretention seed mix shall be New England Wetland Plants, Amherst, MA, New England Erosion Control/Restoration Mix for Detention Basis and Moist Sites.

Botanical name	Common name
Elymus reparius	Riverbank wild rye
Schizachyrium scoparium	Little bluestem
Festuca rubra	Red fescue
Andropogon gerardii	Big bluestem
Panicum virgatum	Switch grass
Vernonia noveboracensis	New York Ironwood
Agrostis perennans	Upland Bentgrass
Bidens frondose	Beggar ticks
Eupatorium maculatum	Spotted Joe Pye weed
Eupatorium perfoliatum	Boneset
Aster novae-angliae	New England aster
Scirpus cyperinus	Wool grass
Juncus effusus	Soft grass

Follow the manufacturer's instructions for seeding methods and rates.

B. Turf Grass Mix

Turf Grass Mix	
Percent by Weight	**Common Name**
45	Firebird 2 or Rebel IV or Firecracker SL fescue
20	Grand slam GLD or Confetti II perennial ryegrass
15	Radar or Compus chewings fescue
10	Sword or Gladiator hard fescue
5	Side Oats Grama
5	White Dutch clover

Apply at a rate of 7 lbs/1,000 SF or 305 lbs/acre.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of existing conditions before starting work.

B. Verify existing plant life designated to remain is tagged or identified.

3.2 PREPARATION

A. Call Dig Safe service at 1-888-DIG-SAFE (811) not less than three working days before performing work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Prior to altering any utilities, obtain consent of utility service provider.
   1. Arrange with the utility service providers to shut off utilities to be disturbed as indicated on the Drawings and inform Owner Representative of anticipated interruption.

C. Refer to Drawings and regulatory requirements for excavation and compaction requirements and details.

3.3 MECHANICAL SEEDING

A. No seeding shall be done on frozen soil or when conditions are not favorable for successful seed germination.
B. Seeds shall be sown in calm weather when soil has adequate moisture for germination.
C. Seeds shall be sown according to the manufacturer's recommended seed rate for the specified seed mix.
D. Seeds shall be sown using either broadcast seeding, drill seeding, or disc seeding method that maximizes seed to soil contact for the project area conditions.
E. Cover seed by raking and chain harrowing.
F. Roll seeded areas with roller not exceeding 100 lbs.

3.4 HYDRO-MULCHING

A. Hydromulch shall be used as post-seeding protection mulch. Hydromulch shall not be the primary application method for seeding.

B. Hydromulch Wood Fiber with Tackifier shall be applied at a rate of 1,200-1,500 pounds per acre on 3:1 slopes or flatter, or at 1,500-2,000 pounds per acre on slopes steeper than 3:1.

3.5 POTECTION OF SEEDED AREAS

A. Contractor shall provide adequate protection to protect seeded areas from all damage, disturbance, or other construction activity after seeding operations are complete. Remove protection after seed areas are properly established.

B. Damaged seed areas resulting from inadequate protection shall be promptly repaired with topsoil, and seed at Contractor’s expense. All damages shall be repaired prior to final acceptance.

3.6 SEED PROTECTION ON SLOPES

A. Cover all prepared and seeded slopes 3:1 or steeper with erosion control blanket.

B. Lay blanket smoothly on soil surface. Overlap adjacent sections of blanket and staple.

C. Secure blanket to ground with staples in accordance with manufacturer’s instructions.

D. Minimize damage to seedbed during installation of blanket. Regrade by hand raking as required, to correct any damage.

3.7 INSTALLATION AND BEGINNING OF MAINTENANCE PERIOD

A. The materials and landscape construction methods shall be in conformance with the Drawings and related sections.

B. Following completion of turf seeding and sodding, the Contractor shall request the Owner Representative in writing for a formal inspection of the planting work. If materials and workmanship are acceptable, written notice will be provided by the Owner Representative to the Contractor stating that the work has received provisional approval of installation and that the 90-day maintenance period for sod and seeded turf shall commence.
   1. The 90-day maintenance period shall occur only during the growing season May 1 to October 15.
   2. If final inspection would occur at the end of the growing season, the 90-day maintenance period shall be extended, and shall start at the beginning of the next growing season starting as of May 1 of the next year.
   3. If the 90-day maintenance period is not complete by October 15, it shall be extended into the next growing season starting again as of May 1.
   4. Sod and seeded areas that die or show obvious decline or loss of 5% of healthy growth during the maintenance period, shall be removed and replaced at once, unless designated otherwise in writing by the Landscape Architect.

C. After the minimum 90-day maintenance period of sod and turf lawns, the Contractor shall again request the Owner Representative, in writing, for an inspection to determine whether the plant material is acceptable. If the plant material and workmanship are acceptable, written notice will be given by the Owner Representative to the Contractor followed by a final written acceptance.

D. The 12-month maintenance period for seeded wildflower and bioretention areas shall include an end of season mowing to distribute seeds. If these seeded locations have failed to demonstrate adequate growth to a height of 6 inches by October 1, mowing should be avoided; these areas should be evaluated the following spring for the need for reseeding.

E. After the 12-month maintenance period of seeded wildflower and bioretention areas, the Contractor shall again request the Owner Representative, in writing, for an inspection to determine whether the plant material is acceptable. If the plant material and workmanship are acceptable, written notice will be given by the Owner Representative to the Contractor followed by a final written acceptance.

3.9 MAINTENANCE AND PROTECTION FOR SEEDED AREAS

A. Lawn Areas

1. Maintenance shall begin immediately after any area is seeded, and shall continue until final written acceptance by the Owner Representative.
2. Maintenance shall include reseeding, mowing, watering, weeding, liming and fertilizing.
3. Watering of Seeded Areas:
   a. First Week: The Contractor shall provide all labor and arrange for all watering necessary to establish an acceptable lawn. In the absence of an adequate rainfall, watering shall be performed daily or as often as necessary during the first week and in sufficient quantities to maintain moist soil to a depth of at least two (2) inches.
   b. Second and Subsequent Weeks: The Contractor shall water the lawn as required to maintain adequate moisture, in the upper two (2) inches of soil, necessary for the promotion of deep root growth.
   c. Watering shall be done in a manner that will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas,

and prevent damage to the finished surface by the watering equipment. The Contractor shall furnish sufficient watering equipment to apply one complete coverage to the seeded areas in an eight (8) hour period.

4. Protection:
   a. Seeded areas shall be protected by a three (3) foot high barrier constructed of two-by-four stakes or iron pipes set eighteen inches in the ground at ten (10) foot intervals and connected by No. 10 wire. Flags of white cloth shall be secured to the wire at center points between stakes.
   b. Barriers must be raised immediately after seeding and shall be maintained until acceptance.
5. Reseeding:
   a. After the grass in seeded areas has appeared, all areas and parts of areas which, in the opinion of the Owner Representative, fail to show a uniform stand of grass, for any reason whatsoever, shall be reseeded and such areas and parts of areas shall be seeded repeatedly until all areas are covered with a satisfactory growth of grass. Reseeding together with necessary grading, trimming, fertilizing and watering shall be done at the expense of the Contractor.
6. Mowing:
   a. Seeded Areas: The Contractor shall keep seeded areas mowed until final written acceptance of the seeding by the Owner Representative by cutting to a height of two and one half (2 ½") inches or as directed by the Owner Representative.
   b. During maintenance, seeded areas should not be permitted to grow higher than three and one half (3 ½").
7. Fertilizing:
   a. Fertilizer, MAY be applied after one (1) season of growth of a minimum of two (2) months duration only during the months of April, May, August, or September. Fertilizer shall be applied if seed or sod is failing and applied according to the results of soil testing.
   b. Additional limestone applications as required by the soils analysis to bring the pH levels of the topsoil and/or loam borrow to the specified range shall be the full responsibilities of the Contractor.

B. Bioretention Seeded Locations

1. Maintenance shall begin immediately after any area is seeded, and shall continue until final written acceptance by the Owner Representative.
2. Maintenance shall include reseeding, mowing, watering, and weeding. Many wildflowers will establish a basal rosette (a small group of leaves held close to the ground) and a deep root system their first year.
   a. Watering of Seeded Areas: First and Second Weeks: The Contractor shall provide all labor and arrange for all watering necessary to establish an acceptable wildflower meadow. In the absence of an adequate rainfall, watering shall be performed daily or as often as necessary during the first week and in sufficient quantities to maintain moist but not wet, soil to a depth of at least two (2) inches.
   b. Subsequent Weeks: The Contractor shall water the areas weekly for the duration of the establishment season as required to maintain adequate moisture, in the upper 2 inches of soil, necessary for the promotion of adequate germination and seedling root establishment.
   c. Watering shall be done in a manner that will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas,

and prevent damage to the finished surface by the watering equipment. The Contractor shall furnish sufficient watering equipment to apply one complete coverage to the seeded areas in an 8-hour period.

d. Monitor the site closely and be prepared to provide supplemental irrigation only as needed to maintain moist but not wet conditions to prevent seeds from either rotting or drying out.

e. Newly established seedlings are tender. As seedlings establish gradually reduce irrigation to enable the plants to adapt to their natural environment.

3. Protection:

a. Seeded areas shall be protected by a 3-foot-high barrier constructed of two-by-four stakes or iron pipes set eighteen inches in the ground at 10-foot intervals and connected by No. 10 wire. Flags of white cloth shall be secured to the wire at center points between stakes.

b. Barriers must be raised immediately after seeding and shall be maintained until acceptance.

4. Reseeding:

a. After wildflower seedlings in seeded areas has appeared, all areas and parts of areas which, in the opinion of the Owner Representative, fail to show a uniform stand of wildflower seedlings, for any reason whatsoever, shall be reseeded and such areas and parts of repeatedly until all areas are covered with a satisfactory growth of seedlings. Reseeding together with necessary grading, and watering shall be done at the expense of the Contractor.

b. Reseeding as directed, shall be accomplished, weather permitting, between October 15 and November 20 or April 15 to June 15.

5. Mowing:

a. Maintenance during first year of establishment: One mowing of the wildflower establishment areas shall be done by the Contractor for disbursement of the produced seed and for general appearance of these areas. All mowing shall be done as soon as wildflower species have reached a mature seed head stage between October 1 and October 30. If grade allows, mowing should be done with a three-point rotary brush mower ("Brush Hog") at a cutting height of 4 inches.

3.11 END OF WARRANTY FINAL ACCEPTANCE / MAINTENANCE OBSERVATION

A. After all necessary corrective work and clean-up has been completed by the Contractor, the Owner Representative will certify in writing the final written acceptance of the seeded and/or sodded areas.

B. The Contractor's responsibility for maintenance of seeded and sodded areas shall cease on receipt of the final written acceptance at the end of the identified maintenance period.

C. Payment for maintenance of plants and landscaping work shall be paid until the guarantee period for landscaping is complete and on receipt of the final written acceptance by the Owner Representative.

END OF SECTION

SECTION 32 93 00 – PLANTING

PART 1 – GENERAL

1.1 SUMMARY

A. The scope of work includes all labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for, and incidental to performing all operations in connection with furnishing, delivery, and installation of plant (also known as "landscaping") complete as shown on the drawings and as specified herein.

B. The scope of work in this section includes, but is not limited to, the following:

1. Locate, purchase, deliver and install all specified plants.
2. Water all specified plants.
3. Mulch, fertilize, stake, and prune all specified plants.
4. Maintenance of all specified plants until the beginning of the warranty period.
5. Plant warranty.
6. Clean up and disposal of all excess and surplus material.
7. Maintenance of all specified plants during the warranty period.

1.2 CONTRACT DOCUMENTS

A. Shall consist of specifications and general conditions and the construction drawings. The intent of these documents is to include all labor, materials, and services necessary for the proper execution of the work. The documents are to be considered as one. Whatever is called for by any parts shall be as binding as if called for in all parts.

1.3 RELATED DOCUMENTS AND REFERENCES

A. Related Documents:

1. Drawings and general provisions of contract including general and supplementary conditions and Division I specifications apply to work of this section
2. Related Specification Sections
   a. Section 32 91 00 - Planting Soil
   b. Section 32 92 00 - Turf and Grasses

B. References: The following specifications and standards of the organizations and documents listed in this paragraph form a part of the specification to the extent required by the references thereto. In the event that the requirements of the following referenced standards and specification conflict with this specification section the requirements of this specification shall prevail. In the event that the requirements of any of the following referenced standards and specifications conflict with each other the more stringent requirement shall prevail or as determined by the Owners Representative.

1. ANSI Z60.1 American Standard for Nursery Stock, most current edition.
2. ANSI A 300 – Standard Practices for Tree, Shrub and other Woody Plant Maintenance, most current edition and parts.
3. Interpretation of plant names and descriptions shall reference the following documents. Where the names or plant descriptions disagree between the several documents, the most current document shall prevail.
   a. USDA - The Germplasm Resources Information Network (GRIN) http://www.ars-grin.gov/npgs/searchgrin.html
   b. Manual of Woody Landscape Plants; Michael Dirr; Stipes Publishing, Champaign, Illinois; Most Current Edition.

4. Pruning practices shall conform to recommendations “Structural Pruning: A Guide For The Green Industry” most current edition; published by Urban Tree Foundation, Visalia, California.
5. Glossary of Arboricultural Terms, International Society of Arboriculture, Champaign IL, most current edition.

1.4 VERIFICATION

A. All scaled dimensions on the drawings are approximate. Before proceeding with any work, the Contractor shall carefully check and verify all dimensions and quantities and shall immediately inform the Owner Representative of any discrepancies between the information on the drawings and the actual conditions, refraining from doing any work in said areas until given approval to do so by the Owner Representative.

B. In the case of a discrepancy in the plant quantities between the plan drawings and the plant call outs, list or plant schedule, the number of plants or square footage of the planting bed drawn on the plan drawings shall be deemed correct and prevail.

1.5 PERMITS AND REGULATIONS

A. The Contractor shall perform Work in accordance with professional standards, applicable permit conditions, and regulatory requirements. Wherever references are made to standards or codes in accordance with which work is to be performed or tested, the edition or revision of the standards and codes current on the effective date of this contract shall apply, unless otherwise expressly set forth.

B. The Contractor shall conform to applicable code for environmental requirements, disposal of debris, and use of herbicides.

C. In case of conflict among any referenced standards or codes or among any referenced standards and codes and the specifications, the more restrictive standard shall apply or Owner Representative shall determine which shall govern.

1.6 PROTECTION OF WORK, PROPERTY AND PERSON

A. The Contractor shall adequately protect the work, adjacent property, and the public, and shall be responsible for any damages or injury due to his/her actions.

1.7 CHANGES IN THE WORK

A. The Owner Representative may order changes in the work, and the contract sum should be adjusted accordingly. All such orders and adjustments plus claims by the Contractor for extra compensation must be made and approved in writing before executing the work involved.

B. All changes in the work, notifications and contractor’s request for information (RFI) shall conform to the contract general condition requirements.

1.8 CORRECTION OF WORK

A. The Contractor, at their own cost, shall re-execute any work that fails to conform to the requirements of the contract and shall remedy defects due to faulty materials or workmanship upon written notice from the Owner Representative, at the soonest as possible time that can be coordinated with other work and seasonal weather demands.

1.9 DEFINITIONS

All terms in this specification shall be as defined in the “Glossary of Arboricultural Terms” or as modified below.

A. Boxed trees: A container root ball package made of wood in the shape of a four-sided box.

B. Container plant: Plants that are grown in and/or are currently in a container including boxed trees.

C. Defective plant: Any plant that fails to meet the plant quality requirement of this specification.

D. End of Warranty Final Acceptance: The date when the Owner Representative accepts that the plants and work in this section meet all the requirements of the warranty. It is intended that the materials and workmanship warranty for Planting, Planting Soil, and Irrigation work run concurrent with each other.

E. Field grown trees (B&B): Trees growing in field soil for at least 12 months prior to harvest.

F. Healthy: Plants that are growing in a condition that expresses leaf size, crown density, color; and with annual growth rates typical of the species and cultivar's horticultural description, adjusted for the planting site soil, drainage and weather conditions.

G. Kinked root: A root within the root package that bends more than 90 degrees.

H. Maintenance: Actions that preserve the health of plants after installation and as defined in this specification.

I. Maintenance period: The time period, as defined in this specification, which the Contractor is to provide maintenance.

J. Normal: the prevailing protocol of industry standard(s).

K. Owner Representative: The person appointed by the Owner to represent their interest in the review and approval of the work and to serve as the contracting authority with the Contractor. The Owner Representative may appoint other persons to review and approve any aspects of the work.

L. Reasonable and reasonably: When used in this specification relative to plant quality, it is intended to mean that the conditions cited will not affect the establishment or long-term stability, health or growth of the plant. This specification recognizes that it is not possible to produce plants free of all defects, but that some accepted industry protocols and standards result in plants unacceptable to this project.

When reasonable or reasonably is used in relation to other issues such as weeds, diseased, insects, it shall mean at levels low enough that no treatment would be required when applying recognized Integrated Plant Management practices.

This specification recognizes that some decisions cannot be totally based on measured findings and that professional judgment is required. In cases of differing opinion, the Owner Representative's expert shall determine when conditions are judged as reasonable.

M. Root ball: The mass of roots including any soil or substrate that is shipped with the tree within the root ball package.

N. Root ball package. The material that surrounds the root ball during shipping. The root package may include the material in which the plant was grown, or new packaging placed around the root ball for shipping.

O. Root collar (root crown, root flare, trunk flare, flare): The region at the base of the trunk where the majority of the structural roots join the plant stem, usually at or near ground level.

P. Shrub: Woody plants with mature height approximately less than 15 feet; typically, multi-stemmed with mass, dense forms.

Q. Spade harvested and transplanted: Field grown trees that are mechanically harvested and immediately transplanted to the final growing site without being removed from the digging machine.

R. Stem: The trunk of the tree.

S. Substantial Completion Acceptance: The date at the end of the Planting, Planting Soil, and Irrigation installation where the Owner Representative accepts that all work in these sections is complete and the Warranty period has begun. This date may be different than the date of substantial completion for the other sections of the project.

T. Stem girdling root: Any root more than ¼ inch diameter currently touching the trunk, or with the potential to touch the trunk, above the root collar approximately tangent to the trunk circumference or circling the trunk. Roots shall be considered as Stem Girdling that have, or are likely to have in the

future, root to trunk bark contact.

U. Structural root: One of the largest roots emerging from the root collar.

V. Tree: Single and multi-stemmed plants with mature height approximately greater than 15 feet.

1.10 SUBMITTALS

A. Submit all product submittals 4 weeks prior to installation of plantings.

B. Product data: Submit manufacturer product data and literature describing all products required by this section to the Owner Representative for approval. Provide submittal 4 weeks before the installation of plants.

C. Plant growers' certificates: Submit plant growers' certificates for all plants indicating that each meets the requirements of the specification, including the requirements of tree quality, to the Owner Representative for approval. Provide submittal eight weeks before the installation of plants.

D. Samples: Submit samples of each product and material where required by the specification to the Owner Representative for approval. Label samples to indicate product, characteristics, and locations in the work. Samples will be reviewed for appearance only. Compliance with all other requirements is the exclusive responsibility of the Contractor.

E. Plant sources: Submit sources of all plants as required by Article – "Selection of Plants" to the Owner Representative for approval.

F. Close out submittals: Submit to the Owner Representative for approval and receipt of final written acceptance.

1. Plant maintenance data and requirements.

G. Warranty period site visit record: If there is no maintenance during the warranty period, after each site visit during the warranty period, by the Contractor, as required by this specification, submit a written record of the visit, including any problems, potential problems, and any recommended corrective action to the Owner Representative for approval.

1.11 OBSERVATION OF THE WORK

A. The Owner Representative may observe the work at any time. They may remove samples of materials for conformity to specifications. Rejected materials shall be immediately removed from the site and replaced at the Contractor's expense. The cost of testing materials not meeting specifications shall be paid by the Contractor.

B. The Owner Representative shall be informed of the progress of the work so the work may be observed at the following key times in the construction process. The Owner Representative shall be afforded sufficient time to schedule visit to the site. Failure of the Owner Representative to make field observations shall not relieve the Contractor from meeting all the requirements of this specification.

1. SITE CONDITIONS PRIOR TO THE START OF PLANTING: review the soil and drainage conditions.

2. COMPLETION OF THE PLANT LAYOUT STAKING: Review of the plant layout.

3. PLANT QUALITY: Review of plant quality at the time of delivery and prior to installation. Review tree quality prior to unloading where possible, but in all cases prior to planting.

4. COMPLETION OF THE PLANTING: Review the completed planting.

1.12 PRE-CONSTRUCTION CONFERENCE

A. Schedule a pre-construction meeting with the Owner Representative at least seven (7) days before beginning work to review any questions the Contractor may have regarding the work, administrative procedures during construction and project work schedule.

1.13 QUALITY ASSURANCE

A. Substantial Completion Acceptance - Acceptance of the work prior to the start of the warranty period:

1. Once the Contractor completes the installation of all items in this section, the Owner Representative will observe all work for Substantial Completion Acceptance upon written request of the Contractor. The request shall be received at least ten calendar days before the anticipated date of the observation.

2. Substantial Completion Acceptance by the Owner Representative shall be for general conformance to specified size, character and quality and not relieve the Contractor of responsibility for full conformance to the contract documents, including correct species.

3. Any plants that are deemed defective as defined under the provisions below shall not be accepted.

B. The Owner Representative will provide the Contractor with written acknowledgment of the date of Substantial Completion Acceptance and the beginning of the warranty period and plant maintenance period.

C. Contractor's Quality Assurance Responsibilities: The Contractor is solely responsible for quality control of the work.

D. Installer Qualifications: The installer shall be a firm having at least 5 years of successful experience of a scope similar to that required for the work, including the handling and planting of large specimen trees in urban areas. The same firm shall install planting soil and plant material.

1. The bidders list for work under this section shall be approved by the Owner Representative.

2. Installer Field Supervision: When any planting work is in progress, installer shall maintain, on site, a full-time supervisor who can communicate in English with the Owner Representative.

3. Installer's field supervisor shall have a minimum of five years experience as a field supervisor installing plants and trees of the quality and scale of the proposed project, and can communicate in English with the Owner Representative.

4. The installer's crew shall have a minimum of 3 years experienced in the installation of Planting Soil, Plantings, and Irrigation (where applicable) and interpretation of soil plans, planting plans and irrigation plans.

5. Submit references of past projects, employee training certifications that support that the Contractors meets all of the above installer qualifications and applicable licensures.

1.14 PLANT WARRANTY

A. Plant Warranty:

1. The Contractor agrees to replace defective work and defective plants. The Owner Representative shall make the final determination if plants meet these specifications or that plants are defective.

   Plants warranty shall begin on the date of Substantial Completion Acceptance and continue for the following periods, classed by plant type:
   a. Trees – 1 Year(s).
   b. Shrubs – 1 Year(s).
   c. Ground cover and perennial flower plants – 1 Year(s).

2. When the work is accepted in parts, the warranty periods shall extend from each of the partial Substantial Completion Acceptances to the terminal date of the last warranty period. Thus, all warranty periods for each class of plant warranty, shall terminate at one time.

3. All plants shall be warrantied to meet all the requirements for plant quality at installation in this specification. Defective plants shall be defined as plants not meeting these requirements. The Owner Representative shall make the final determination that plants are defective.

4. Plants determined to be defective shall be removed immediately upon notification by the Owner Representative and replaced without cost to the Owner, as soon as weather conditions permit and within the specified planting period.
5. Any work required by this specification or the Owner Representative during the progress of the work, to correct plant defects including the removal of roots or branches, or planting plants that have been bare rooted during installation to observe for or correct root defects shall not be considered as grounds to void any conditions of the warranty. In the event that the Contractor decides that such remediation work may compromise the future health of the plant, the plant or plants in question shall be rejected and replaced with plants that do not contain defects that require remediation or correction.
6. The Contractor is exempt from replacing plants, after Substantial Completion Acceptance and during the warranty period, that are removed by others, lost or damaged due to occupancy of project, lost or damaged by a third party, vandalism, or any natural disaster.
7. Replacements shall closely match adjacent specimens of the same species. Replacements shall be subject to all requirements stated in this specification. Make all necessary repairs due to plant replacements. Such repairs shall be done at no extra cost to the Owner.
8. The warranty of all replacement plants shall extend for an additional one-year 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 warranty period, the Owner Representative may elect one more replacement items or credit for each item. These tertiary replacement items are not protected under a warranty period.
9. During and by the end of the warranty period, remove all tree wrap, ties, and guying unless agreed to by the Owner Representative to remain in place. All trees that do not have sufficient caliper to remain upright, or those requiring additional anchorage in windy locations, shall be staked or remain staked, if required by the Owner Representative.

B. End of Warranty Final Acceptance - Acceptance of plants at the end of the warranty period.

1. At the end of the warranty period, the Owner Representative shall observe all warranted work, upon written request of the Contractor. The request shall be received at least ten calendar days before the anticipated date for final observation.
2. End of Warranty Final Acceptance will be given only when all the requirements of the work under this specification and in specification sections Planting Soil, Turfs and Grasses, and Irrigation have been met.

1.15 SELECTION AND OBSERVATION OF PLANTS

A. The Owner Representative may review all plants subject to approval of size, health, quality, character, etc. Review or approval of any plant during the process of selection, delivery, installation and establishment period shall not prevent that plant from later rejection in the event that the plant quality changes or previously existing defects become apparent that were not observed.

B. Plant Selection: The Owner Representative reserves the right to select and observe all plants at the nursery prior to delivery and to reject plants that do not meet specifications as set forth in this specification. If a particular defect or substandard element can be corrected at the nursery, as determined by the Owner Representative, the agreed upon remedy may be applied by the nursery or the Contractor provided that the correction allows the plant to meet the requirements set forth in this specification. Any work to correct plant defects shall be at the contractor’s expense.
   1. The Owner Representative may make invasive observation of the plant’s root system in the area of the root collar and the top of the root ball in general in order to determine that the plant meets the quality requirements for depth of the root collar and presence of roots above the root collar. Such observations will not harm the plant.
   2. Corrections are to be undertaken at the nursery prior to shipping.

C. The Contractor shall bear all cost related to plant corrections.

D. All plants that are rejected shall be immediately removed from the site and acceptable replacement plants provided at no cost to the Owner.

E. Submit to the Owner Representative, for approval, plant sources including the names and locations of nurseries proposed as sources of acceptable plants, and a list of the plants they will provide. The plant list shall include the botanical and common name and the size at the time of selection. Observe all nursery materials to determine that the materials meet the requirements of this section.

F. The Contractor shall require the nursery grower or re-wholesale supplier to permit the Owner Representative to observe the root system of all trees and plants at the nursery or job site prior to planting including random removal of soil or substrate around the base of the plant. Observation may be as frequent and as extensive as needed to verify that the plants meet the requirements of the specifications and conform to requirements.

1.16 PLANT SUBSTITUTIONS FOR PLANTS NOT AVAILABLE

A. Submit all requests for substitutions of plant species, or size to the Owner Representative, for approval, prior to purchasing the proposed substitution. Request for substitution shall be accompanied with a list of nurseries contacted in the search for the required plant and a record of other attempts to locate the required material. Requests shall also include sources of plants found that may be of a smaller or larger size, or a different shape or habit than specified, or plants of the same genus and species but different cultivar origin, or which may otherwise not meet the requirements of the specifications, but which may be available for substitution.

1.17 SITE CONDITIONS

A. It is the responsibility of the Contractor to be aware of all surface and sub-surface conditions, and to notify the Owner Representative, in writing, of any circumstances that would negatively impact the health of plantings. Do not proceed with work until unsatisfactory conditions have been corrected.

1. Should subsurface drainage or soil conditions be encountered which would be detrimental to growth or survival of plant material, the Contractor shall notify the Owner Representative in writing, stating the conditions and submit a proposal covering cost of corrections. If the Contractor fails to notify the Owner Representative of such conditions, he/she shall remain responsible for plant material under the warranty clause of the specifications.

B. It is the responsibility of the Contractor to be familiar with the local growing conditions, and if any specified plants will be in conflict with these conditions. Report any potential conflicts, in writing, to the Owner Representative.

C. This specification requires that all Planting Soil and Irrigation (if applicable) work be completed and accepted prior to the installation of any plants.

1. Planting operations shall not begin until such time that the irrigation system is completely operational for the area(s) to be planted, and the irrigation system for that area has been preliminarily observed and approved by the Owner Representative.

D. Actual planting shall be performed during those periods when weather and soil conditions are suitable in accordance with locally accepted horticultural practices.

1. Do not install plants into saturated or frozen soils. Do not install plants during inclement weather, such as rain or snow or during extremely hot, cold or windy conditions.

1.18 PLANTING AROUND UTILITIES

A. Contractor shall carefully examine the civil, record, and survey drawings to become familiar with the existing underground conditions before digging.

B. Determine location of underground utilities and perform work in a manner that will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until parties concerned mutually agree upon removal.

C. Contact Dig Safe at 811 at least 72 business hours prior to digging. Once notified, Dig Safe will contact member utilities to come to your site and mark underground utility wires, cables and pipelines. This free service can protect you from unintentionally hitting underground utility lines, which can cause harm to you and those around you, disrupt service to an entire neighborhood and potentially make you liable for fines and repair costs. Please note, utility companies will only mark the facilities they own or maintain. Private underground pipes and cables may not be owned or maintained by member utility companies. It is the responsibility of the property owner to investigate if any privately owned utilities are in the area.

PART 2 – PRODUCTS

2.1 PLANTS: GENERAL

A. Standards and measurement: Provide plants of quantity, size, genus, species, and variety or cultivars as shown and scheduled in contract documents.

1. All plants including the root ball dimensions or container size to trunk caliper ratio shall conform to ANSI Z60.1 “American Standard for Nursery Stock” latest edition, unless modified by provisions in this specification. When there is a conflict between this specification and ANSI Z60.1, this specification section shall be considered correct.

2. Plants larger than specified may be used if acceptable to the Owner Representative. Use of such plants shall not increase the contract price. If larger plants are accepted the root ball size shall be in accordance with ANSI Z-60.1. Larger plants may not be acceptable if the resulting root ball cannot be fit into the required planting space.

B. Proper Identification: All trees shall be true to name as ordered or shown on planting plans and shall be labeled individually or in groups by genus, species, variety and cultivar.

C. Compliance: All trees shall comply with federal and state laws and regulations requiring observation for plant disease, pests, and weeds. Observation certificates required by law shall accompany each shipment of plants.

D. Plant Quality:

1. General: Provide healthy stock, grown in a nursery and reasonably free of die-back, disease, insects, eggs, bores, and larvae. At the time of planting all plants shall have a root system, stem, and branch form that will not restrict normal growth, stability and health for the expected life of the plant

2. Plant quality above the soil line:
   a. Plants shall be healthy with the color, shape, size and distribution of trunk, stems, branches, buds and leaves normal to the plant type specified.
   b. Trees shall have one central leader. If the leader was headed, a new leader (with a live terminal bud) at least one-half the diameter of the pruning cut shall be present.
      1.) All trees are assumed to have one central leader trees unless a different form is specified in the plant list or drawings.
   c. Trunk caliper and taper shall be sufficient so that the lower five feet of the trunk remains vertical without a stake. Auxiliary stake may be used to maintain a straight leader in the upper half of the tree.

3. Plant quality at or below the soil line:
   a. Plant roots shall be normal to the plant type specified. Root observations shall take place without impacting tree health. Root quality at or below the soil line shall comply with the project Root Acceptance details and the following:
      1.) The roots shall be reasonably free of scrapes, broken or split wood.

2.) The root system shall be reasonably free of injury from biotic (e.g., insects and pathogens) and abiotic (e.g., herbicide toxicity and salt injury) agents. Wounds resulting from root pruning used to produce a high quality root system are not considered injuries.
3.) At time of observations and delivery, the root ball shall be moist throughout. Roots shall not show signs of excess soil moisture conditions as indicated by stunted, discolored, distorted, or dead roots.

E. Submittals: Submit for approval the required plant quality certifications from the grower where plants are to be purchased, for each plant type. The certification must state that each plant meets all the above plant quality requirements.
1. The grower's certification of plant quality does not prohibit the Owner Representative from observing any plant or rejecting the plant if it is found to not meet the specification requirements.

2.2 ROOT BALL PACKAGE OPTIONS: The following root ball packages are permitted. Specific root ball packages shall be required where indicated on the plant list or in this specification. Any type of root ball packages that is not specifically defined in this specification shall not be permitted.

A. BALLED AND BURLAPPED PLANTS

1. All Balled and Burlapped Plants shall be field grown, and the root ball packaged in a burlap and twine and/or burlap and wire basket package.

2. Plants shall be harvested with the following modifications to standard nursery practices.

B. SPADE HARVESTED AND TRANSPLANTED

1. Spade Harvested and Transplanted Plants shall meet all the requirements for field grown trees. Root ball diameters shall be of similar size as the ANSI Z60.1 requirements for Balled and Burlapped plants.
2. Trees shall be harvested prior to leafing out (bud break) in the spring or during the fall planting period except for plants know to be considered as fall planting hazards. Plants that are fall planting hazards shall only be harvested prior to leafing out in the spring.
3. Trees shall be moved and planted within 48 hours of the initial harvesting and shall remain in the spade machine until planted.

C. CONTAINER (INCLUDING ABOVE-GROUND FABRIC CONTAINERS AND BOXES) PLANTS

1. Container plants may be permitted only when indicated on the drawing, in this specification, or approved by the Owner Representative.

2. Provide plants shall be established and well rooted in removable containers.

3. Container class size shall conform to ANSI Z60.1 for container plants for each size and type of plant.

D. BARE ROOT PLANTS

1. Harvest bare root plants while the plant is dormant and a minimum of 4 weeks prior to leaf out (bud break).

2. The root spread dimensions of the harvested plants shall conform to ANSI Z60.1 for nursery grown bare root plants for each size and type of plant. Just prior to shipping to the job site, dip the root system into a slurry of hydrogel (cross linked polyacrylamide) and water mixed at a rate of 15 oz. of hydrogel in 25 gallons of water. Do not shake off the excess hydrogel. Place the root system in a pleated black plastic bag and tie the bag snugly around the trunk. Bundle and tie the upper branches together.

3. Keep the trees in a cool dark space for storage and delivery. If daytime outside temperatures exceeds 70 degrees F, utilize a refrigerated storage area with temperature between 35 and 50 degrees.

4. Where possible, plan time of planting to be before bud break. For trees to be planted after bud

break, place the trees before bud break in an irrigated bed of pea gravel.

a. The pea gravel bed shall be 18 inches deep over a sheet of plastic.

b. Space trees to allow the unbundled branches to grow without shading each other.

c. Once stored in pea gravel, allow the trees sufficient time for the new root system to flush and spring growth of leaves to fully develop before planting.

d. Pea gravel stored trees may be kept for up to one growing season.

e. Pea gravel stored trees shall be dipped, packaged and shipped similar to the requirements for freshly dug bare root trees above.

E. IN-GROUND FABRIC BAG-GROWN

1. In-ground fabric container plants may be permitted only when indicated on the drawing, in this specification, or approved by the Owner Representative.

2. Provide plants established and well rooted.

2.3 PLANTING SOIL

A. Planting Soil as used in this specification means the soil at the planting site, or imported as modified and defined in specification Section Planting Soil.

2.4 MULCH

A. Mulch shall be coarse, ground, from tree and woody brush sources. The size range shall be a minimum (less than 25% or less of volume) fine particles 3/8 inch or less in size, and a maximum size of individual pieces (largest 20% or less of volume) shall be approximately 1 to 1-1/2 inch in diameter and maximum length approximately 4 to 6". Pieces larger than 6 inch long that are visible on the surface of the mulch after installation shall be removed.

B. Submit supplier’s product specification data sheet and a one gallon sample for approval.

2.5 TREE STAKING AND GUYING MATERIAL

A. Tree guying to be flat woven polypropylene material, 3/4 inch wide, and 900 lb. break strength. Color to be Green. Product to be ArborTie manufactured by Deep Root Partners, L.P. or approved equal.

B. Stakes shall be lodge pole stakes free of knots and of diameters and lengths appropriate to the size of plant as required to adequately support the plant.

2.6 WATERING BAGS

A. Plastic tree watering bags holding a minimum of 15 gallons of water and with a slow drip hole(s) water release system, specifically designed to water establishing trees. Water should release over a several day period, not within a few hours

B. Watering bags shall be:
1. Treegator Irrigation Bags sized to the appropriate model for the requirements of the plant, manufactured by Spectrum Products, Inc., Youngsville, NC 27596.
2. Ooze Tube sized to the appropriate model for the requirements of the plant, manufactured by Engineered Water Solutions, Atlanta, GA.
3. Or approved equal.

C. Submit manufacturer’s product data for approval.

PART 3 – EXECUTION

3.1 SITE EXAMINATION

A. Examine the surface grades and soil conditions to confirm that the requirements of the Specification Section – Planting Soil - and the soil and drainage modifications indicated on the Planting Soil Plan and Details (if applicable) have been completed. Notify the Owner Representative in writing of any unsatisfactory conditions.

3.2 DELIVERY, STORAGE AND HANDLING

A. Protect materials from deterioration during delivery and storage. Adequately protect plants from drying out, exposure of roots to sun, wind or extremes of heat and cold temperatures. If planting is delayed more than 24 hours after delivery, set plants in a location protected from sun and wind. Provide adequate water to the root ball package during the shipping and storage period.

1. All plant materials must be available for observation prior to planting.

2. Using a soil moisture meter, periodically check the soil moisture in the root balls of all plants to assure that the plants are being adequately watered. Volumetric soil moisture shall be maintained above wilting point and below field capacity for the root ball substrate or soil.

B. Do not deliver more plants to the site than there is space with adequate storage conditions. Provide a suitable remote staging area for plants and other supplies.

1. The Owner Representative or Contractor shall approve the duration, method and location of storage of plants.

C. Provide protective covering over all plants during transporting.

3.3 PLANTING SEASON

A. Planting shall only be performed when weather and soil conditions are suitable for planting the materials specified in accordance with locally accepted practice. Install plants during the planting time as described below unless otherwise approved in writing by the Owner Representative. In the event that the Contractor request planting outside the dates of the planting season, approval of the request does not change the requirements of the warranty.

1. Deciduous trees and shrubs shall be planted during the following time periods:
   Spring:
   Deciduous materials–April 1 through June 1
   Evergreen materials–April 15 through June 1
   Fall:
   Deciduous materials–September 15 through December 1
   Evergreen materials–August 15 through October 15
2. Contractor shall schedule tree selection and digging operations to comply with nursery industry recognition of ‘Spring Dig Only’ or ‘Fall Hazard’ plant materials. No substitutions of plant materials will be allowed for fall planting based on unavailability due to the ‘Spring Dig Only’ or ‘Fall Hazard’ restrictions. Contractor shall have selected and had the material dug during the previous spring

3.4 ADVERSE WEATHER CONDITIONS

A. No planting shall take place during extremely hot, dry, windy, or freezing weather.

3.5 COORDINATION WITH PROJECT WORK

A. The Contractor shall coordinate with all other work that may impact the completion of the work.

B. Prior to the start of work, prepare a detailed schedule of the work for coordination with other trades.

C. Coordinate the relocation of any irrigation lines, heads or the conduits of other utility lines that are in conflict with tree locations. Root balls shall not be altered to fit around lines. Notify the Owner Representative of any conflicts encountered.

3.6 LAYOUT AND PLANTING SEQUENCE

A. Relative positions of all plants and trees are subject to approval of the Owner Representative.

B. Notify the Owner Representative, one (1) week prior to layout. Layout all individual tree and shrub locations. Place plants above surface at planting location or place a labeled stake at planting location. Layout bed lines with paint for the Owner Representative's approval. Secure the Owner Representative's acceptance before digging and start of planting work.

C. When applicable, plant trees before other plants are installed.

D. It is understood that plants are not precise objects and that minor adjustments in the layout will be required as the planting plan is constructed. These adjustments may not be apparent until some or all of the plants are installed. Make adjustments as required by the Owner Representative including relocating previously installed plants.

3.7 SOIL PROTECTION DURING PLANT DELIVERY AND INSTALLATION

A. Protect soil from compaction during the delivery of plants to the planting locations, digging of planting holes and installing plants.

1. Where possible deliver and plant trees that require the use of heavy mechanized equipment prior to final soil preparation and tilling. Where possible, restrict the driving lanes to one area instead of driving over and compacting a large area of soil.

2. Till to a depth of 6 inches, all soil that has been driven over during the installation of plants.

3.8 INSTALLATION OF PLANTS: GENERAL

A. Observe each plant after delivery and prior to installation for damage of other characteristics that may cause rejection of the plant. Notify the Owner Representative of any condition observed.

B. No more plants shall be distributed about the planting bed area than can be planted and watered on the same day.

C. The root system of each plant, regardless of root ball package type, shall be observed by the Contractor, at the time of planting to confirm that the roots meet the requirements for plant root quality in Part 2 Products: Plants General: Plant Quality. The Contractor shall undertake at the time of planting, all modifications to the root system required by the Owner Representative to meet these quality standards.

1. Modifications, at the time of planting, to meet the specifications for the depth of the root collar and removal of stem girdling roots and circling roots may make the plant unstable or stress the plant to the point that the Owner Representative may choose to reject the plant rather than permitting the modification.

2. Any modifications required by the Owner Representative to make the root system conform to the plant quality standards outlined in Part 2 Products: Plants General: Quality, or other requirements related to the permitted root ball package, shall not be considered as grounds to modify or void the plant warranty.

3. The resulting root ball may need additional staking and water after planting. The Owner Representative may reject the plant if the root modification process makes the tree unstable or if the tree is not healthy at the end of the warranty period. Such plants shall still be covered under the warranty

4. The Contractor remains responsible to confirm that the grower has made all required root modifications noted during any nursery observations.

D. Container and Boxed Root Ball Shaving: The outer surfaces of ALL plants in containers and boxes, including the top, sides and bottom of the root ball shall be shaved to remove all circling, descending, and matted roots. Shaving shall be performed using saws, knives, sharp shovels or other suitable equipment that is capable of making clean cuts on the roots. Shaving shall remove a minimum of one inch of root mat or up to 2 inches as required to remove all root segments that are not growing

reasonably radial to the trunk.

E. Exposed Stem Tissue after Modification: The required root ball modifications may result in stem tissue that has not formed trunk bark being exposed above the soil line. If such condition occurs, wrap the exposed portion of the stem in a protective wrapping with a white filter fabric. Secure the fabric with biodegradable masking tape. DO NOT USE string, twine, green nursery ties or any other material that may girdle the trunk if not removed.

F. Excavation of the Planting Space: Using hand tools or tracked mini-excavator, excavate the planting hole into the Planting Soil to the depth of the root ball measured after any root ball modification to correct root problems, and wide enough for working room around the root ball or to the size indicated on the drawing or as noted below.
   1. For trees and shrubs planted in soil areas that are NOT tilled or otherwise modified to a depth of at least 12 inches over a distance of more than 10 feet radius from each tree, or 5 feet radius from each shrub, the soil around the root ball shall be loosened as defined below or as indicated on the drawings.
      a. The area of loosening shall be a minimum of 3 times the diameter of the root ball at the surface sloping to 2 times the diameter of the root ball at the depth of the root ball.
      b. Loosening is defined as digging into the soil and turning the soil to reduce the compaction. The soil does not have to be removed from the hole, just dug, lifted and turned. Lifting and turning may be accomplished with a tracked mini excavator, or hand shovels.
   2. If an auger is used to dig the initial planting hole, the soil around the auger hole shall be loosened as defined above for trees and shrubs planted in soil areas that are NOT tilled or otherwise modified.
   3. The measuring point for root ball depth shall be the average height of the outer edge of the root ball after any required root ball modification.
   4. If motorized equipment is used to deliver plants to the planting area over exposed planting beds, or used to loosen the soil or dig the planting holes, all soil that has been driven over shall be tilled to a depth of 6 inches.

G. For trees to be planted in prepared Planting Soil that is deeper than the root ball depth, compact the soil under the root ball using a mechanical tamper to assure a firm bedding for the root ball. If there is more than 12 inches of planting soil under the root ball excavate and tamp the planting soil in lifts not to exceed 12 inches.

H. Set top outer edge of the root ball at the average elevation of the proposed finish. Set the plant plumb and upright in the center of the planting hole. The tree graft, if applicable, shall be visible above the grade. Do not place soil on top of the root ball.

I. The Owner Representative may request that plants orientation be rotated when planted based on the form of the plant.

J. Backfill the space around the root ball with the same planting soil or existing soil that was excavated for the planting space. See Specification Section Planting Soil, for requirements to modify the soil within the planting bed.

K. Brace root ball by tamping Planting Soil around the lower portion of the root ball. Place additional Planting Soil around base and sides of ball in six-inch (6") lifts. Lightly tamp each lift using foot pressure or hand tools to settle backfill, support the tree and eliminate voids. DO NOT over compact the backfill or use mechanical or pneumatic tamping equipment.
   1. When the planting hole has been backfilled to three quarters of its depth, water shall be poured around the root ball and allowed to soak into the soil to settle the soil. Do not flood the planting space. If the soil is above field capacity, allow the soil to drain to below field capacity before finishing the planting. Air pockets shall be eliminated and backfill continued until the planting soil is brought to grade level.

L. Where indicated on the drawings, build a 4 inch high, level berm of Planting Soil around the outside of the root ball to retain water. Tamp the berm to reduce leaking and erosion of the saucer.

M. Thoroughly water the Planting Soil and root ball immediately after planting.

N. Remove all nursery plant identification tags and ribbons as per Owner Representative instructions. The Owner Representative's seals are to remain on plants until the end of the warranty period.

O. Remove corrugated cardboard trunk protection after planting.

P. Follow additional requirements for the permitted root ball packages.

3.9 PERMITTED ROOT BALL PACKAGES AND SPECIAL PLANTING REQUIREMENTS

A. The following are permitted root ball packages and special planting requirements that shall be followed during the planting process in addition to the above General planting requirements.

B. BALLED AND BURLAPPED PLANTS

1. After the root ball has been backfilled, remove all twine and burlap from the top of the root ball. Cut the burlap away; do not fold down onto the Planting Soil.

2. If the plant is shipped with a wire basket that does not meet the requirements of a "Low Rise" basket, remove the top 6 - 8 inches of the basket wires just before the final backfilling of the tree.

3. Earth root balls shall be kept intact except for any modifications required by the Owner Representative to make root package comply with the requirement in Part 2 Products.

C. SPADE HARVESTED AND TRANSPLANTED PLANTS

1. After installing the tree, loosen the soil along the seam between the root ball and the surrounding soil out to a radius from the root ball edge equal to the diameter of the root ball to a depth of 8 - 10 inches by hand digging to disturb the soil interface.
2. Fill any gaps below this level with loose soil.

D. CONTAINER (INCLUDES BOXED AND ABOVE-GROUND FABRIC CONTAINERS) PLANTS

1. This specification assumes that most container plants have significant stem girdling and circling roots, and that the root collar is too low in the root ball.

2. Remove the container.

3. Perform root ball shaving as defined in Installation of Plants: General above.

4. Remove all roots and substrate above the root collar and the main structural roots according to root correction details so root system conforms to root observations detail.

5. Remove all substrate at the bottom of the root ball that does not contain roots.

6. Using a hose, power washer or air excavation device, wash out the substrate from around the trunk and top of the remaining root ball and find and remove all stem girdling roots within the root ball above the top of the structural roots.

E. BARE ROOT PLANTS

1. Dig the planting hole to the diameter of the spread of the roots to a depth in the center that maintains the root collar at the elevation of the surrounding finished grade and slightly deeper along the edges of the hole.

2. Spread all roots out radial to the trunk in the prepared hole making the hole wider where needed to accommodate long roots. Root tips shall be directed away from the trunk. Prune any broken roots removing the least amount of tissue possible.

3. Maintain the trunk plumb while backfilling soil around the roots.

4. Lightly tamp the soil around the roots to eliminate voids and reduce settlement.

F. IN-GROUND FABRIC CONTAINERS

1. Remove the fabric container from the root ball. Cut roots at the edge of the container as needed to extract the fabric from the roots. Make clean cuts with sharp tools; do not tear roots away from the fabric.

2. Observe the root system after the container is removed to confirm that the root system meets the quality standards.

3.10 GROUND COVER, PERENNIAL AND ANNUAL PLANTS

A. Assure that soil moisture is within the required levels prior to planting. Irrigation, if required, shall be applied at least 12 hours prior to planting to avoid planting in muddy soils.

B. Assure that soil grades in the beds are smooth and as shown on the plans.

C. Plants shall be planted in even, triangularly spaced rows, at the intervals called out for on the drawings, unless otherwise noted. The first row of Annual flower plants shall be 6 inches from the bed edge unless otherwise directed.

D. Dig planting holes sufficiently large enough to insert the root system without deforming the roots. Set the top of the root system at the grade of the soil.

E. Schedule the planting to occur prior to application of the mulch. If the bed is already mulched, pull the mulch from around the hole and plant into the soil. Do not plant the root system in the mulch. Pull mulch back so it is not on the root ball surface.

F. Press soil to bring the root system in contact with the soil.

G. Spread any excess soil around in the spaces between plants.

H. Apply mulch to the bed being sure not to cover the tops of the plants with or the tops of the root ball with mulch.

I. Water each planting area as soon as the planting is completed. Apply additional water to keep the soil moisture at the required levels. Do not over water.

3.11 STAKING AND GUYING

A. Do not stake or guy trees unless specifically required by the Contract Documents, or in the event that the Contractor feels that staking is the only alternative way to keep particular trees plumb.

1. The Owner Representative shall have the authority to require that trees are staked or to reject staking as an alternative way to stabilize the tree.

2. Trees that required heavily modified root balls to meet the root quality standards may become unstable. The Owner Representative may choose to reject these trees rather than utilize staking to temporarily support the tree.

B. Trees that are guyed shall have their guys and stakes removed after one full growing season or at other times as required by the Owner Representative.

C. Tree guying shall utilize the tree staking and guying materials specified. Guying to be tied in such a manner as to create a minimum 12-inch loop to prevent girdling. Refer to manufacturer's recommendations and the planting detail for installation.
1. Plants shall stand plumb after staking or guying.
2. Stakes shall be driven to sufficient depth to hold the tree rigid.

D. For trees planted in planting mix over waterproofed membrane, use dead men buried 24 inches to the top of the dead man, in the soil. Tie the guy to the dead man with a double wrap of line around the dead man followed by a double half hitch. When guys are removed, leave the dead men in place and cut the guy tape 12 inches above the ground, leaving the tape end covered in mulch.

3.12 TREE BARK PROTECTION

A. For all street trees in commercial areas where indicted on the drawings, apply a Tree Bark Protector to each tree.

3.13 STRAIGHTENING PLANTS

A. Maintain all plants in a plumb position throughout the warranty period. Straighten all trees that move out of plumb including those not staked. Plants to be straightened shall be excavated and the root ball moved to a plumb position, and then re-backfilled.

B. Do not straighten plants by pulling the trunk with guys.

3.14 INSTALLATION OF FERTILIZER AND OTHER CHEMICAL ADDITIVES

A. Do not apply any soluble fertilizer to plantings during the first year after transplanting unless soil test determines that fertilizer or other chemical additives is required. Apply chemical additives only upon the approval of the Owner Representative.

B. Controlled release fertilizers shall be applied according to the manufacturer's instructions and standard horticultural practices.

3.15 PRUNING OF TREES AND SHRUBS

A. Prune plants as directed by the Owner Representative. Pruning trees shall be limited to addressing structural defects as shown in details; follow recommendations in "Structural Pruning: A Guide For The Green Industry" published by Urban Tree Foundation, Visalia CA.

B. All pruning shall be performed by a person experienced in structural tree pruning.

C. Except for plants specified as multi-stemmed or as otherwise instructed by the Owner Representative, preserve or create a central leader.

D. Pruning of large trees shall be done using pole pruners or if needed, from a ladder or hydraulic lift to gain access to the top of the tree. Do not climb in newly planted trees. Small trees can be structurally pruned by laying them over before planting. Pruning may also be performed at the nursery prior to shipping.

E. Remove and replace excessively pruned or malformed stock resulting from improper pruning that occurred in the nursery or after.

F. Pruning shall be done with clean, sharp tools.

G. No tree paint or sealants shall be used.

3.16 MULCHING OF PLANTS

A. Apply 4 inches of mulch before settlement, covering the entire planting bed area. Install no more than 1 inch of mulch over the top of the root balls of all plants. Taper to 2 inches when abutting pavement.

B. For trees planted in lawn areas the mulch shall extend to a 5-foot radius around the tree or to the extent indicated on the plans.

C. Lift all leaves, low hanging stems and other green portions of small plants out of the mulch if covered.

3.17 PLANTING BED FINISHING

A. After planting, smooth out all grades between plants before mulching.

B. Separate the edges of planting beds and lawn areas with a smooth, formed edge cut into the turf with the bed mulch level slightly lower, 1 and 2 inches, than the adjacent turf sod or as directed by the Owner Representative. Bed edge lines shall be a depicted on the drawings.

3.18 WATERING

A. The Contractor shall be fully responsible to ensure that adequate water is provided to all plants from the point of installation until the date of Substantial Completion Acceptance. The Contractor shall adjust the automatic irrigation system, if available, and apply additional or adjust for less water using

hoses as required.

B. Hand water root balls of all plants to assure that the root balls have moisture above wilt point and below field capacity. Test the moisture content in each root ball and the soil outside the root ball to determine the water content.

C. The Contractor shall install adequately sized (15-25 gallon) watering bag for each tree to be maintained and used for tree watering during the warranty period.

1. The watering bags shall remain the property of the Owner at the completion of the work.

3.19 CLEAN-UP

A. During installation, keep the site free of trash, pavements reasonably clean and work area in an orderly condition at the end of each day. Remove trash and debris in containers from the site no less than once a week.
1. Immediately clean up any spilled or tracked soil, fuel, oil, trash or debris deposited by the Contractor from all surfaces within the project or on public right of ways and neighboring property.

B. Once installation is complete, wash all soil from pavements and other structures. Ensure that mulch is confined to planting beds and that all tags and flagging tape are removed from the site. The Owner Representative's seals are to remain on the trees and removed at the end of the warranty period.

C. Make all repairs to grades, ruts, and damage by the plant installer to the work or other work at the site.

D. Remove and dispose of all excess planting soil, subsoil, mulch, plants, packaging, and other material brought to the site by the Contractor.

3.20 PROTECTION DURING CONSTRUCTION

A. The Contractor shall protect planting and related work and other site work from damage due to planting operations, operations by other Contractors or trespassers. Maintain protection during installation until Substantial Completion Acceptance. Treat, repair or replace damaged work immediately.

B. Damage done by the Contractor, or any of their sub-contractors to existing or installed plants, or any other parts of the work or existing features to remain, including roots, trunk or branches of large existing trees, soil, paving, utilities, lighting, irrigation, other finished work and surfaces including those on adjacent property, shall be cleaned, repaired or replaced by the Contractor at no expense to the Owner. The Owner Representative shall determine when such cleaning, replacement or repair is satisfactory.

3.21 PLANT MAINTENANCE PRIOR TO SUBSTANTIAL COMPLETION ACCEPTANCE

A. During the project work period and prior to Substantial Completion Acceptance, the Contractor shall maintain all plants.

B. Maintenance during the period prior to Substantial Completion Acceptance 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 reasonably free of damaging insects and disease, and in healthy condition. The threshold for applying insecticides and herbicide shall follow established Integrated Pest Management (IPM) procedures. Mulch areas shall be kept reasonably free of weeds, grass.

3.22 SUBSTANTIAL COMPLETION ACCEPTANCE

A. Upon written notice from the Contractor, the Owners Representative shall review the work and make a determination if the work is substantially complete.
1. Notification shall be at least 7 days prior to the date the contractor is requesting the review.

B. The date of substantial completion of the planting shall be the date when the Owner Representative

accepts that all work in Planting, Planting Soil, and Irrigation installation sections is complete.

C. The Plant Warranty period begins at date of written notification of substantial completion from the Owner Representative. The date of substantial completion may be different than the date of substantial completion for the other sections of the project.

3.23 MAINTENANCE DURING THE WARRANTY PERIOD BY THE PLANT INSTALLER

A. During the warranty period, provide all maintenance for all plantings to keep the plants in a healthy state and the planting areas clean and neat.

B. General requirements:
   1. All work shall be undertaken by trained planting crews under the supervision of a foreman with a minimum of 5 years experience supervising commercial plant maintenance crews.
   2. All chemical and fertilizer applications shall be made by licensed applicators for the type of chemicals to be used. All work and chemical use shall comply with all applicable local, provincial and federal requirements.
   3. Assure that hoses and watering equipment and other maintenance equipment does not block paths or be placed in a manner that may create tripping hazards. Use standard safety warning barriers and other procedures to maintain the site in a safe manner for visitors at all times.
   4. All workers shall wear required safety equipment and apparel appropriate for the tasks being undertaken.
   5. The Contractor shall not store maintenance equipment at the site at times when they are not in use unless authorized in writing by the Owner Representative.
   6. Maintenance vehicles shall not park on the site including walks and lawn areas at any time without the Owner Representative's written permission.
   7. Maintain a detailed log of all maintenance activities including types of tasks, date of task, types and quantities of materials and products used, watering times and amounts, and number of each crew. Periodically review the logs with the Owner Representative, and submit a copy of the logs at the end of each year of the maintenance agreement.
   8. Meet with the Owner Representative a minimum of three times a year to review the progress and discuss any changes that are needed in the maintenance program. At the end of the warranty period attend a hand over meeting to formally transfer the responsibilities of maintenance to the Owner Representative. Provide all information on past maintenance activities and provide a list of critical tasks that will be needed over the next 12 months. Provide all maintenance logs and soil test data. Make the Contractor's supervisor available for a minimum of one year after the end of the warranty period to answer questions about past maintenance.

C. Provide the following maintenance tasks:
   1. Watering; Provide all water required to keep soil within and around the root balls at optimum moisture content for plant growth.
      a. Maintain all watering systems and equipment and keep them operational.
      b. Monitor soil moisture to provide sufficient water. Check soil moisture and root ball moisture with a soil moisture meter on a regular basis and record moisture readings. Do not over water.
   2. Soil nutrient levels: Take a minimum of 4 soil samples from around the site in the spring and fall and have them tested by an accredited agricultural soil testing lab for chemical composition of plant required nutrients, pH, salt and % organic matter. Test results shall include laboratory recommendations for nutrient applications. Apply fertilizers at rates recommended by the soil test.
      a. Make any other soil test and/or plant tissue test that may be indicated by plant conditions that may not be related to soil nutrient levels such as soil contaminated by other chemicals or lack of chemical uptake by the plant.
   3. Plant pruning: Remove cross over branching, shorten or remove developing co dominant leaders, dead wood and winter-damaged branches. Unless directed by the Owner Representative, do not shear plants or make heading cuts.
   4. Restore plants: Reset any plants that have settled or are leaning as soon as the condition is

noticed.

5. Guying and staking: Maintain plant guys in a taught position. Remove tree guys and staking after the first full growing season unless directed by Owner Representative.
6. Weed control: Keep all beds free of weeds. Hand-remove all weeds and any plants that do not appear on the planting plan. Chemical weed control is permitted only with the approval of the Owner Representative. Schedule weeding as needed but not less *6 times per year*.
7. Trash removal: Remove all trash and debris from all planting beds and maintain the beds in a neat and tidy appearance. The number of trash and debris removal visits shall be no less than 6 times per year and may coincide with other maintenance visits.
8. Plant pest control: Maintain disease, insects and other pests at manageable levels. Manageable levels shall be defined as damage to plants that may be noticeable to a professional but not to the average person. Use least invasive methods to control plant disease and insect outbreaks.
    a. The Owner Representative must approve in advance the use of all chemical pesticide applications.
9. Plant replacement: Replace all plants that are defective as defined in the warranty provisions, as soon as the plant decline is obvious and in suitable weather and season for planting as outlined in above sections. Plants that become defective during the maintenance period shall be covered and replaced under the warranty provisions.
10. Mulch: Refresh mulch once a year to maintain complete coverage but do not over mulch. At no time shall the overall mulch thickness be greater than 4 inches (measured before the mulch layer settles). Do not apply mulch within 6 inches of the trunks or stems of any plants. Replacement mulch shall meet the requirements of the original approved material. Mulch shall be no more than one inch on top of the root ball surface.
11. Bed edging: Check and maintain edges between mulch and lawn areas in smooth neat lines as originally shown on the drawings.
12. Leaf, fruit and other plant debris removal: Remove fall leaf, spent flowers, fruit and plant part accumulations from beds and paved surfaces. Maintain all surface water drains free of debris. Debris removal shall be undertaken at each visit to weed or pick up trash in beds.
13. Damage from site use: Repair of damage by site visitors and events, beyond normal wear, are not part of this maintenance. The Owner Representative may request that the Contractor repair damage beds or plantings for an additional cost. All additional work shall be approved in advance by the Owner Representative.

3.24 END OF WARRANTY FINAL ACCEPTANCE / MAINTENANCE OBSERVATION

A. At the end of the Warranty and Maintenance period the Owner Representative shall observe the work and establish that all provisions of the contract are complete and the work is satisfactory.
    1. If the work is satisfactory, the maintenance period will end on the date of the final observation and the Contractor shall receive receipt of final written acceptance of the work by the Owner Representative.
    2. If the work is deemed unsatisfactory, the maintenance period will continue at no additional expense to the Owner until the work has been completed, observed, and approved by the Owner Representative. At that time final written acceptance will be provided.

B. Payment for maintenance of plants and landscaping work shall not be paid until the guarantee period of landscaping is complete and on final written acceptance by the Owner Representative.

C. FAILURE TO PASS OBSERVATION: If the work fails to pass final observation, any subsequent observations must be rescheduled as per above. The cost to the Owner for additional observations will be charged to the Contractor at the prevailing hourly rate of the Owners Representative.

END OF SECTION