PROJECT MANUAL

LANDSCAPE CONSTRUCTION DOCUMENTS

for

City of Woodruff
Downtown Landscape Enhancement
Woodruff, South Carolina

TECHNICAL PROVISIONS FOR:

City of Woodruff
231 E Hayne Street,
Woodruff, SC 29388

Released for Bidding Date: 12/01/2023

PREPARED BY:
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**DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS**

**DIVISION 01 – GENERAL REQUIREMENTS**

Procedures for Action and Informational Submittals including Delegated-Design Submittals and Submittals Schedule.

**DIVISION 31 – EARTHWORK**

Excavating, filling and backfilling, compacting, and grading.

**DIVISION 32 – EXTERIOR IMPROVEMENTS**

Heads, pipes, and controls.

Nursery-grown trees and other plants, pesticides, tree stabilization, tree watering devices, landscape edgings, and tree grates.

**DIVISION 34 – TRANSPORTATION SIGNALING AND CONTROL EQUIPMENT**

Traffic Control Equipment
INSTRUCTIONS TO BIDDER

SECTION 00 21 13
INSTRUCTIONS TO BIDDER

IB-01 GENERAL

All proposals must be presented in a sealed envelope, addressed to the Owner. The proposal must be filed with the Owner on or before the time stated in the Invitation for Bids. Mailed proposals will be treated in every respect as though filed in person and will be subject to the same requirements. All bids will be opened at the designated time and place and will be read aloud.

Proposals received subsequent to the time stated will be returned unopened. Prior to the time stated any proposal may be withdrawn at the discretion of the bidder, but no proposal may be withdrawn for a period of thirty (30) days after bids have been opened, pending the execution of a contract with successful bidder.

IB-02 EXAMINATION OF WORK

Each bidder shall, by careful examination, satisfy himself as to the nature and location of the work, the conformation of the ground, the character, quality and quantity of the facilities needed preliminary to and during the execution of the work, the general and local conditions, and all other matters which can in anyway affect the work or the cost thereof under the contract. No verbal agreement or conversation with any officer, agent, or employee of the Owner, either before or after the execution of the contract, shall affect or modify any of the terms or obligations therein.

IB-03 ADDENDA AND INTERPRETATIONS

No interpretation of the meaning of the plans, specifications or other pre-bid documents will be made to any bidder orally.

Every request for such interpretation should be in writing addressed to The LandArt Design Group, Inc.; 647 East Main Street, Spartanburg, South Carolina 29302 and to be given consideration must be received at least five days prior to the date fixed for the opening of bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be sent by certified mail with return receipt requested to all prospective bidders (at the respective address furnished for such purpose), not later than three days prior to the date fixed for the opening of bids. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under this bid as submitted. All addenda so issued shall become part of the Contract Document.

IB-04 PREPARATION OF BIDS

Bids shall be submitted on the forms provided and must be signed by the bidder or his authorized representative. Any corrections to entries made on bid forms should be initialed by the person signing the bid.

Bidders must quote on all items appearing on the bid forms.

Alternate bids will not be considered unless specifically called for.

Faxed bids will not be considered. Modifications to bids already submitted will be allowed if submitted by fax prior to the time fixed in the Invitation for Bids. Modifications shall be submitted as such and shall not reveal the total amount of either the original or reversed bid.
Bids by wholly owned proprietorships or partnerships will be signed by all Owners. Bids of corporations will be signed by an officer of the firm and his signature attested by the secretary thereof who will affix the corporate seal to the proposal.

**IB-05 BASIS OF AWARD**

The bids will be compared on the basis of a lump sum price, which will include and cover the furnishing of materials and the performance of all labor requisite or proper and completing of all the work called for under the accompanying contract, and in the manner set forth and described in the specifications.

The proposed quantities as shown in certain items of the proposal are for the purpose of comparing bids and awarding payment of monthly estimates for items of construction complete in place. It is the responsibility of the Contractor to check all items of construction since final payment will be rendered according to the lump sum amount as bid in the proposal. In case of error in the quantities as shown, the lump sum amount as stated in the proposal will prevail at the end of the job when final payment is rendered except as set forth in the specifications. Should an error in the quantities be noted, the prospective bidder should notify immediately the Landscape Architect who will check the quantity and issue addendum to all prospective bidders correcting the faulty quantity. The bid will indicate that the bidder agrees completely with quantities as shown and is willing to accept the total lump sum bid as payment in full for all work as shown on the plans or covered in the specifications.

**IB-06 BIDDER’S QUALIFICATIONS**

The Owner may make such investigations as are deemed necessary to determine the ability of the bidder to perform the work and the bidder shall furnish to him all such additional information and data for this purpose as may be requested. The Owner reserves the right to reject the bid if the information submitted by the bidder, or investigation of the bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the Contract and to complete the work contemplated therein. Part of the evidence required above shall consist of a list of the names and addresses of not less than five (5) firms or owners for whom the bidder has done similar work.

**IB-07 PAYMENT AND PERFORMANCE BOND**

None Required.

**IB-08 REJECTIONS OF BIDS**

These proposals are asked for in good faith, and awards will be made as soon as practicable, provided satisfactory bids are received. The right is reserved, however, to waive informalities in bidding, to reject any or all proposals, or to accept a bid other than the lowest submitted if such action is deemed to be in the best interest of the Owner.

END OF SECTION 00 21 13
SECTION 00 41 43
BID FORM

PROJECT: City of Woodruff Downtown Landscape Enhancement

DATE: _________________________________

TO: The City of Woodruff
    231 East Hayne Street
    Woodruff, SC 29388

SUBMITTED BY: _____________________________________

The undersigned, as Contractor hereby declares that the only person or persons interested in the proposal as principal or principals is or are named herein, and that no other person than herein mentioned has any interest in this proposal or in the Contract to be entered into; that this proposal is made without connection with any other person, company, or parties making a proposal; and that it is in all respects fair and in good faith without collusion or fraud.

BASE BID:

The undersigned, having carefully examined the Drawings and Project Manual entitled Downtown Landscape Enhancement Documents for the City of Woodruff all dated 12/01/2023 and the following:

Addendum No.__________________________ dated ________
Addendum No.__________________________ dated ________
Addendum No.__________________________ dated ________

as well as the premises and conditions affecting the work, proposes to furnish all services, labor and materials called for by them for the entire work in accordance with Contract Documents for the LUMP SUM of _______________________________ Dollars ($_____________), which sum is hereinafter called the "Base Bid".

UNIT PRICE SUBMISSION:

The undersigned proposes that the unit price submissions on the attached Unit Price Schedule are to be used as a basis for pricing change orders and approving pay requests for work completed and in place. The unit price includes all labor, materials, equipment, profit and overhead.

BID HOLDING TIME:

The undersigned hereby agrees that the bid may not be revoked or withdrawn after the time set for opening of bids but shall remain open for acceptance for a period of thirty (30) calendar days following the opening of bids.

COMPLETION DATE:

The undersigned hereby agrees to commence actual physical work on the site with an adequate force and equipment five (5) calendar days from date of "Notice to Proceed".

The undersigned agrees to complete the Work of this Contract within 90 calendar days (day determined by the City of Woodruff) after the "Notice to Proceed".
QUANTITY VERIFICATION:
Material quantities have been carefully calculated; however, the contractor is responsible for his own quantity calculations as the Landscape Architect assumes no responsibility for quantities. Significant discrepancies shall be reported to the Landscape Architect.

We, the undersigned, hereby declare that we have the legal status checked below:

1. ~ Individual
2. ~ Partnership, having the following partners.
   a. 
   b. 
   c. 
3. ~ Corporation, Incorporated under the state laws of

Respectfully submitted,

COMPANY:
ADDRESS:

By:
TITLE:
L.S.
DATE:

Seal if Bidder is a Corporation.
S.C. Bidder's License No.
S.C. Contractor's License No.
Witness:
Date:
# | ITEM | SIZE | QTY | UNIT | UNIT PRICE | EXTENSION |
<table>
<thead>
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<td>1</td>
<td>Project Setup &amp; Mobilization</td>
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<td>2</td>
<td>Temporary Facilities</td>
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<td>3</td>
<td>Traffic Control</td>
<td>LS @</td>
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**GENERAL CONDITIONS**

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<td>1</td>
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<td>SF @</td>
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<td>2’ Wide Paver Demolition</td>
<td>SF @</td>
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<td>3</td>
<td>Zelkova Tree Removal</td>
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<td>4</td>
<td>Tree Stump Removal</td>
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<td>5</td>
<td>Redbud Tree Removal</td>
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**DEMONITION - EARTHWORK**

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<tr>
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<td>Tan Creek Stone - 3-4” Size</td>
<td>CY @</td>
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<td>2</td>
<td>Pine Hall® Brick Pavers - Rumbled Madrid Running Bond</td>
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<td>Daddy Pete's Sandy Loam Top Soil 1 CF Bag</td>
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**GENERAL CONSTRUCTION**

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<td>New Drip</td>
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**IRRIGATION**

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<td>1</td>
<td>Luxor® 300 Main Transformer</td>
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<td>2</td>
<td>WiFiMod2</td>
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<td>Link-Mod</td>
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<td>4</td>
<td>LSAT 300 Satelitte Transformer</td>
<td>EA @</td>
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<td>CC Up Light</td>
<td>EA @</td>
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<td>Electrical Work</td>
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<td>7</td>
<td>Outdoor Outlet Repairs</td>
<td>LS @</td>
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**LIGHTING**

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<tbody>
<tr>
<td>1</td>
<td>ACER BUERGERIANUM 'RUSTYALLEN' (Multi-Stem)</td>
<td>B &amp; B/16’ Min.</td>
<td>6</td>
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<td>ACER PALMATUM 'RYUSEN'</td>
<td>B &amp; B/4” Cal.</td>
<td>1</td>
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<td>CERCIS CANADENSIS VAR. ‘RUBY FALLS’</td>
<td>B &amp; B/3’Cal.</td>
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<td>CHIONANTHUS VIRGINICUS 'RACHEL'S RIBBONCLOUD'</td>
<td>B&amp;B/9’ Min.</td>
<td>2</td>
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<td>CHIONANTHUS VIRGINICUS 'RACHEL'S RIBBONCLOUD'</td>
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<td>6</td>
<td>GINKGO BILOBA 'THE PRESIDENT’</td>
<td>B&amp;B/3.5” Cal.</td>
<td>2</td>
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<td>7</td>
<td>LIRODENDRON TULIPIFERA ‘EMERALD CITY’ TM</td>
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<td>EA</td>
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<td>9</td>
<td>CRYPTOMERIA JAPONICA 'GLOBOSA NANA’</td>
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<td>20</td>
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<td>HYDRANGEA PANICULATA ‘LITTLE LIME’</td>
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<td>11</td>
<td>Lagerstroemia indica ‘Purple Velvet’</td>
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<td>EA</td>
<td>46</td>
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<td>12</td>
<td>Muhlenbergia capillaris</td>
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<td>Muhlenbergia capillaris ‘White Cloud’</td>
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<td>Rosa Meidiland series ‘Peach Drift’</td>
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<td>Schizachyrium scoparium ‘Standing Ovation’</td>
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<td>16</td>
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<td>18</td>
<td>Triple Hammered Hardwood Mulch</td>
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<td>CY</td>
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Subtotal

TOTAL BID

OTHER ITEMS

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<td>Any Other Items</td>
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Subtotal

5% Contingency

TOTAL
1. **SCOPE OF WORK**

The project referred to in the Agreement shall consist of the following major elements:

The general scope of the project base bid will include Demolition and Removal of existing Landscape Material in Islands (24) and pavers, Traffic Control Measures Installation, Landscape Installation, Irrigation Installation, Pavers, Lighting Installation, Tan Creek Stone Installation, Daddy Pete's Sandy Loam Top Soil Installation, and the Coordination of removal and/or burial of Utilities.

2. **ENUMERATION OF THE CONTRACT DRAWINGS**

**BASE BID**

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<th>Overall Landscape Plan</th>
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<td>Sheet L2</td>
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<td>Sheet L3</td>
<td>Landscape Plan 1</td>
</tr>
<tr>
<td>Sheet L4</td>
<td>Landscape Plan 2</td>
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<td>Sheet L5</td>
<td>Plant Images</td>
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<tr>
<td>Sheet L6</td>
<td>Notes &amp; Details</td>
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<td>Sheet L7</td>
<td>Lighting Plan 1</td>
</tr>
<tr>
<td>Sheet L8</td>
<td>Lighting Plan 2</td>
</tr>
<tr>
<td>Sheet L9</td>
<td>Irrigation Plan</td>
</tr>
</tbody>
</table>

3. **RECORD DRAWINGS**

The Contractor will maintain in his office one complete set of drawings (including any supplemental sketches) pertaining to the project upon which, at the end of each day’s work any deviations from the construction lines shown thereon and all changes ordered by the Landscape Architect will be shown accurately in red pencil. If necessary, supplemental drawings will be made to show details of deviations or changes, and these will be kept with the marked set. The drawings will be available to the Landscape Architect for inspection during construction and at the completion of construction; prior to submitting his estimate for final payment, the drawings will be transmitted to the Landscape Architect for preparation of record drawings.

4. **SPECIFIED MATERIALS**

Attention is drawn to the specification of certain brands or manufacturers of construction materials on the drawings. Unless the phrase “or approved equal” appears in the specification thereof, no substitution or deviation from the product specified will be allowed.

END OF SPECIAL CONDITIONS
SECTION 01 33 00
SUBMITTALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. General Submittal Requirements for material, equipment, units of work or finish samples.
   2. Submittals.

B. Related Sections:
   1. General Conditions and Supplementary Conditions.
   2. Division 1 through Division 48.

1.2 GENERAL SUBMITTAL REQUIREMENTS

A. Coordination and Sequencing: Coordinate preparation and processing of submittals with performance of the work so that work will not be delayed by submittals.

   1. General: Submittals will be made as directed by the L. A. Prior to submittal for approval, use all means necessary to fully coordinate material including, but not necessarily limited to:
      a. Determine and verify interface conditions, catalog numbers, and similar data.
      b. Coordinate with other trades as required.
      c. Clearly indicate deviations from requirements of the Contract Documents.

   2. Grouping of Submittals: Unless otherwise specified, make submittals in groups containing associated items to ensure that information is available for checking each item when it is received. Partial submittals may be rejected as not complying with the provisions of the Contract Documents and the Contractor shall be strictly liable for delays as a result.

B. Preparation of Submittals: Provide permanent marking on each submittal to identify project, date, Contractor, subcontractor, submittal type and similar information to distinguish it from other submittals. Show Contractor's executed review and approval marking and provide space for Landscape Architect's/Owner's "Action" marking. Package each submittal appropriately for transmittal and handling.

C. Identification of Submittals:

   1. General: Consecutively number submittals. Accompany each submittal with a letter of transmittal containing pertinent information required for identification and checking of submittals.
2. **Internal Identification:** On at least the first page of each copy of each submittal, and elsewhere as required for positive identification, clearly indicate the submittal number in which the item was included.

3. **Resubmittals:** When material is resubmitted for any reason, transmit under a new letter of transmittal and with new submittal number.

4. **Submittal Log:** Maintain an accurate submittal log for the duration of the Contract, showing current status of submittals at all times. Make the submittal log available for the Landscape Architect's review upon request.

D. **Timing of Submittals:**

1. **General:** Make submittals far enough in advance of scheduled dates for installation to provide time required for reviews, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and securing delivery.

2. **Landscape Architect's Review Time:** In scheduling, allow at least five (5) calendar days for review by the Landscape Architect following receipt of the submittal.

3. **Delays:** Delays caused by tardiness in receipt of submittals will not be an acceptable basis for extension of the Contract completion date.

E. **Transmittal Form:** AIA Form G810 or approved equal.

F. **General Distribution:** Provide additional distribution of approved submittals to subcontractors, suppliers, fabricators, installers, governing authorities and others as necessary for proper performance of the work. Include such additional copies in initial transmittal where required to receive "Action" marking before final distribution. Record distributions on transmittal forms.

G. **Landscape Architect's Review:** Review by the Landscape Architect shall not be construed as a complete check, but only that the material, equipment, finish or general method of construction and detailing is satisfactory. Review shall not relieve the Contractor from responsibility for errors which may exist.

H. **Action on Submittals:**

1. Where submittal must be held for coordination, Contractor will be so advised without delay.

2. **Landscape Architects action:**
   
a. **Approved:** No corrections. Work may proceed.

   b. **Approved as Noted:** Minor amount of corrections. Work may proceed, provided it complies with notations and corrections on submittal. Resubmission not required.

   c. **Approved Except as Noted:** Minor amount of corrections. Items noted are to be clarified further before full approval can be given. Items not noted may proceed. Resubmission required.
d. **Disapproved, Resubmit:** Do not proceed with work. Revise submittal in accordance with notations thereon, and resubmit without delay to obtain a different action marking.

1.3 **SUBMITTALS**

A. **Shop Drawings:**

1. Shop drawings include specially-prepared technical data for this project, including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements and similar information not in standard printed form for general application to a range of similar projects.

2. Provide newly-prepared information, on reproducible sheets, with graphic information at accurate scale (except as otherwise indicated), with name of preparer indicated (firm name). Show dimensions and note which are based on field measurement. Identify materials and products in the work shown. Indicate compliance with standards, and special coordination requirements. Do not allow shop drawing copies to be used in connection with the work without appropriate final "Action" markings by the Landscape Architect.

   a. **Scale and measurements:** Make shop drawings accurately to a scale sufficiently large to show pertinent aspects of the item and its relationship to the Work.

   b. **Initial Submittal:** 2 blue-line or black-line prints; one will be returned.

   c. **Final Submittal:** 3 prints, plus 2 additional prints where required for maintenance manuals; plus, number of prints needed for distribution to others (other than Landscape Architect); 2 will be retained and remainder will be returned, one of which is to be marked-up and maintained by the Contractor as "Record Document".

B. **Product Data:**

1. Product data shall include standard printed information on materials, products, and systems.

2. Collect required data into one submittal for each unit of work or system.

3. Mark each copy to show which choices and options are applicable to project. Include manufacturer's standard printed recommendations for application and use, compliance with standards, application of labels and seals, notation of field measurements which have been checked, and special construction requirements.

4. Maintain one set of product data (for each submittal) at project site, available for reference by Landscape Architect and others.

5. **Submittals:** Do not submit product data, or allow its use on the project, until compliance with requirements of contract documents has been confirmed by Contractor. Submittals are for information and record, unless otherwise indicated. Submit 2 copies, plus 2 additional copies (which will be returned) where required for maintenance manuals.

   a. **At Contractor's option, provide a preliminary single-copy of product data for Landscape Architect's review and "Action".**
b. **Installer's Copy:** Do not proceed with installation of materials, products, or systems until final copy of applicable product data is in possession of Installer.

C. **SAMPLES**

1. Samples include both fabricated and unfabricated physical examples of materials (including plant material), products and units of work; both as complete units and as smaller portions of units of work; either for limited visual inspection or (where indicated) for more detailed testing and analysis.

2. Provide units identical with final condition of proposed materials or products for the work. Include "range" samples (not less than 3 units) where unavoidable variations must be expected, and describe or identify variations between units of each set. Provide full set of optional samples where Landscape Architect's selection is required. Prepare samples to match Landscape Architect's sample where so indicated.

3. Include information with each sample to show generic description, source or product name and manufacturer, limitations, and compliance with standards.

4. Samples are submitted for review and confirmation of color, pattern, texture, and "kind" by Landscape Architect. Landscape Architect will not "test" samples (except as otherwise indicated) for compliance with other requirements, which are therefore the exclusive responsibility of Contractor.

   a. **Submittal:** At Contractor's option, provide preliminary submittal of a single set of samples for Landscape Architect's review and "Action". Submit 3 sets of samples in final submittal; one set will be returned.

   b. **Quality Control Set:** Maintain returned final set of samples at project site, in suitable condition and available for quality control comparisons by Landscape Architect, and by others.

   c. **Reusable Samples:** Returned samples which are intended or permitted to be incorporated in the work are so indicated in the individual work sections, and must be in undamaged condition at time of use.

D. **Mock-Ups**

1. Mock-ups are a special form of samples, which are too large or otherwise inconvenient for handling in specified manner for transmittal of sample submittals.

2. Comply with requirements for "samples" to greatest extent possible and process transmittal forms to provide a record of activity.

E. **Inspection and Test Reports:** Furnish 2 executed copies, except furnish 2 additional copies where required for maintenance manuals. Furnish additional copies desired for Contractor's use.

F. **Warranties:** Furnish 2 executed copies, except furnish 2 additional copies where required for
maintenance manuals. Furnish additional copies desired for Contractor's use.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 01 33 00
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Rough Grading.
   2. Fine Grading.

B. Related Sections:
   1. Division 1: General Requirements
   2. Section 32 93 00: Plants

1.2 SUBMITTALS

A. Submit the following materials certifications:
   1. Pre-emergent Herbicide.

B. Test Reports: submit copies of testing reports to Landscape Architect and Owner of the following:
   1. Topsoil Analysis.
   2. Fill and backfill analysis.
   4. Soil Compaction Tests.

1.3 QUALITY ASSURANCE

A. Perform earthwork operations according to local codes and industry safety standards.

B. Topsoil Analysis Tests: performed by State Agricultural Experiment Station, Soil and Water Conservation District, State University, or other qualified private testing laboratory, as approved by Landscape Architect.

C. Provide and pay for soil testing and inspection for quality control testing during earthwork operations.

1.4 SITE CONDITIONS

A. Environmental Requirements:
   1. Suspend fill operations when environmental conditions are unfavorable for proper compaction of soil layers. Do not use muddy or frozen fill materials. Do not place fill materials on muddy or frozen subgrade surfaces.

B. Existing Conditions:
1. Promptly notify Landscape Architect of unexpected sub-surface conditions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. **Suitable Soil Materials:** Inert subsoil material meeting the following requirements:

1. Maximum laboratory dry weight shall be not less than 90 pounds per cubic foot.
2. Soils weighing less than 100 pounds per cubic foot shall not be used in the top 12 inches of the sub-grade.
3. **Liquid Limit:** not to exceed 65 according to AASHTO T89.
4. **Plasticity Index:** soils with liquid limits between 40 and 65 shall have a plasticity index not less than the liquid limit minus 30 according to AASHTO T90.

B. **Fill Material:** Inert subsoil material free of organic matter, rubbish, debris, and rocks greater than 6 inches diameter and meeting the following requirements:

1. Meet requirements of Suitable Soil Materials above.
2. Provide imported fill material as required to complete work. Obtain rights and pay all costs for imported materials.
3. Utilize on-site borrow fill material if available, when borrow fill is required to complete the work. Verify on-site borrow fill material and locations with Landscape Architect. Regrade and restore areas used for on-site borrow fill as directed by Landscape Architect.
4. If the Contractor places more borrow than is required and thereby causes waste of excavation, the amount of such waste will be deducted from the borrow placed.
5. Proposed fill material shall be inspected, tested, and laboratory report issued prior to use in work.
6. Suitable excavated materials removed to accommodate new construction may be used as fill material subject to laboratory inspection and testing.

D. **Drainage Fill:** AASHTO M43 #6 (3/8 to 3/4 inch) clean uniformly graded stone or gravel.

E. **Topsoil:**

1. Natural, friable, loamy soil characteristic of productive soil in vicinity. It shall be reasonably free of stones larger than 1 inch, clay lumps, roots, toxic substances, debris, and other foreign matter harmful to plant growth.
   a. Shall contain not less than 15 percent nor more than 40 percent organic matter by volume as determined by loss on ignition of samples oven dried to constant weight at 212 F.
   b. **pH range:** Coordinate pH requirements with plant requirements described in Section 32 92 00 and Section 32 93 00. Imported topsoil shall have a pH range of 6.0 to 7.0.
   c. Composition of Soil passing No. 10 Sieve:
i. **Sand**: 20 to 80 percent  
ii. **Silt**: 10 to 75 percent  
iii. **Clay**: 5 to 40 percent  

2. Utilize on-site stockpiled topsoil as required to complete the work. Topsoil not meeting the above requirements shall be amended according to Section 32.93.00.

3. Provide imported topsoil material as required to complete the work. Obtain rights and pay all costs for imported materials.

4. Obtain soil amendment and fertilization recommendations from testing agency for the plant materials specified for the project.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify existing grades indicated on Drawings. Notify Landscape Architect of discrepancies prior to start of grading work.

B. Approval of Rough Grades:

1. Examine existing rough grades produced by other contractor's work. Report to Owner and Landscape Architect conditions that do not meet the following requirements:
   a. Soil is free of materials harmful to plants and free of debris 2 inches or greater in dimension to a depth of 12 inches.
   b. Surface drainage functions as indicated on Drawings.
   c. Rough grade elevations are plus or minus 2 inches from proposed finish grades.

2. Perform no work of this Contract in areas not meeting the above requirements until corrections are made and resumption of work authorized by Landscape Architect.

3.2 PREPARATION

A. Protection of Existing Utilities:

1. Before starting grading and excavation, establish the location and extent of underground utilities in work area. Protect existing utilities during earthwork. Perform excavation work near utilities by hand.

2. Remove abandoned utility service lines from areas of excavation. Consult utility company prior to removal to determine if specific directions are required. Cap, plug, or seal abandoned lines and identify termination points at grade level with markers.

3. Accurately locate and record abandoned and active utility lines rerouted or extended on project record documents.

B. Protection of Persons and Property:
1. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

C. Excess Water Control

1. Provide berms or channels to prevent flooding of subgrade. Promptly remove all water collecting in depressions.

2. Replace soil softened or eroded by water and recompact.

3. Provide and maintain dewatering system components to convey water away from excavations.

3.3 ROUGH GRADING

A. Perform grading within contract limits to new elevations, levels, profiles, and contours indicated. Provide subgrade surfaces parallel to proposed finished surface grades. Provide uniform levels and slopes between new elevations and existing grades.

B. Grade surfaces to ensure positive drainage away from structures and to prevent ponding and pockets of surface drainage.

C. Provide subgrade surfaces free from irregular surface changes. Provide the following subgrade tolerances:

1. **Unpaved Areas:** plus or minus 0.10 feet. Maximum 0.10 feet variation in 10 feet.

2. **Paved Areas:** plus 0 and minus 0.04 feet. Maximum 0.04 feet variation in 10 feet.

3. Horizontal measurement of swale and ditch centerlines to structures shall not be 1 foot less than plan dimensions and locations.

4. Finish required will be that ordinarily obtained from either blade-grader or scraper operations.

5. Provide subgrade surface free of exposed boulders or stones exceeding 4 inches in greatest dimension in paved areas and 2 inches in greatest dimension in unpaved areas.

6. **Lawn and planting areas:** allow for 6 inches average depth of topsoil at lawn and planting areas, except as otherwise specified.

7. Slope subgrade surfaces away from building walls.

3.4 FINE GRADING

A. Uniformly distribute and spread topsoil. Provide 6-inch depth at lawn and planting areas, except as otherwise specified.

B. Fine grade topsoil to lines and elevations indicated on Drawings, eliminating rough and low areas to ensure positive drainage. Maintain levels, profiles, and contours of subgrades.

C. Set fine grade of plant beds 1 inch below adjacent walks or curbs.

D. Remove stones, roots, weeds, and debris while spreading topsoil materials. Rake surface clean of stones one (1) inch or larger in diameter.
E. Manually install topsoil at trees to remain. Avoid damage to root systems.

3.5 COMPACTION

A. **Moisture Conditioning:** Moisture Condition material by aerating or watering and thoroughly mix material to within plus or minus 3 percent of optimum moisture content for compaction.

B. Compact fills, backfills, and subgrades to minimum percentage of density for each area classification.
   1. **Unpaved Areas:** compact each layer of fill and embankments to minimum of 85 percent of maximum dry density.
   2. **Paved Areas and Construction Foundations:** compact each layer of fill and subgrade to minimum of 95 percent of maximum dry density.

C. Percentage of maximum dry density shall be determined by the AASHTO T99 and shall be within plus or minus 2 percent of the optimum moisture content.

D. Water settling, puddling, and jetting of fill and backfill materials as a compaction method are not acceptable.

3.6 VEGETATION CONTROL

A. Apply pre-emergent herbicide to subgrade surfaces in areas of proposed paving and aggregate surfaces.

B. Apply pre-emergent herbicide in strict accordance with manufacturer's installation instructions and recommended application rate.

3.7 FIELD QUALITY CONTROL

A. Obtain samples as required by testing agency.

B. **Topsoil:** Take representative samples of topsoil proposed for use in proposed planting areas and submit to testing laboratory. Provide the following data:
   1. pH factor.
   2. Mechanical analysis.
   3. Percentage of organic content.
   4. Recommendations on type and quantity of additives required to establish satisfactory pH factor and supply of nutrients to bring nutrients to satisfactory level for planting.

3.8 PROTECTION

A. Protect newly graded areas from traffic and erosion until work is accepted. Keep free from trash and debris.

B. Repair, compact, and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

C. Scarify, re-shape, and compact to required density areas disturbed by construction operations or adverse weather.
3.9 DISPOSAL

A. Remove unsuitable excavated material, surplus material, rock, trash, and debris from the site.

END OF SECTION 31 22 00
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Mortarless paving over a rigid base.
   2. Mortared paving over a rigid base.

B. Related work:
   1. Division 1: General Requirements.
   2. Section 32 22 00: Earthwork.
   3. Section 03 30 53: Cast-In-Place Concrete.

1.2 REFERENCES

A. Brick Institute of America, (BIA): Technical Notes on Brick Construction.

1.3 QUALITY ASSURANCE

A. Installation: Performed only by skilled workmen with satisfactory record of performance on completed projects of comparable size and quality.

B. Sample panel: Before starting unit paving, provide a sample panel using materials, patterns, and joints indicated for project work. Build panel at the site of full thickness and approximately 4’-0” x 4’-0”. Provide the range of color, texture, and workmanship proposed for the work. Correct and rebuild sample panel until Landscape Architect's acceptance of the work. Retain panel during construction as a standard for completed paving work.
   1. The approved sample panel may be a portion of the work and remain in place at Contractor's own risk. Location as directed by the Landscape Architect.
   2. Provide a sample panel for each type of unit paving required.

C. Do not change source or brand of unit pavers, mortar, or grout material during the course of the work.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver mortar, grout, and additive materials in manufacturer's unopened and undamaged containers with labels intact and legible. Store off the ground and protect from weather damage, and deterioration. Protect liquid components from freezing.

B. Protect paving units from damage, chipping, and soiling during delivery and storage. Store off the ground on pallets or wood platforms.

C. Store loose granular materials in a well-drained area on a solid surface to prevent mixing with foreign materials.
1.5 PROJECT CONDITIONS

A. Establish and maintain required levels and grade elevations. Review installation procedures and coordinate paving work with other work affected by the paving work.

B. Cold weather:

   1. Protect masonry against freezing when the temperature is 40 degrees F. and falling. Heat materials and provide temporary protection of completed portions of masonry work. Comply with the requirements of the "Construction and Protection Recommendations for Cold Weather Masonry Construction" of BIA Technical Notes on Brick Construction.

   2. Do not use frozen materials or materials mixed or coated with ice or frost. Comply with BIA requirements for masonry units requiring wetting.

   3. Do not build on frozen work. Remove and replace brick paving damaged by frost or freezing.

   4. Do not use anti-freeze or calcium chloride in any mortar or grout.

C. Hot weather: Protect installed brick paving with windbreaks or artificial shade to prevent excessive moisture evaporation of mortar setting beds, mortar, and grout.

D. Protect partially completed unit paving against weather damage when work is not in progress.

E. Protect adjacent work from damage, soiling, and staining during paving operations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. 1. Paving brick: Heartland Flashed Paver - Modular
   3-5/8” X 2-1/4” X 7-5/8”
   Boral® Brick
   300 Airport Road, Greenville, SC 29607
   Phone: (864) 235-7167

B. Portland cement: ASTM C150, Type I, natural color.

   1. Provide white portland cement for colored mortar and grout.

C. Lime: ASTM C207, Type S.

D. Sand: ASTM C144, Washed, clean, and graded.

   1. Provide white sand for colored mortar and grout.

E. Water: Clean, fresh, and potable.

F. Mortar and grout colorant: Mineral oxide pigments, lime and alkali-proof compatible with additives.
F. **Setting bed mortar and grout additive:** Liquid latex mortar additive with a compressive strength of 3,000 psi, bond strength of 500 psi, and water absorption of 4% maximum.

G. **Bond coat additive:** High strength liquid latex mortar additive with a compressive strength of 5,000 psi, bond strength of 500 psi, tensile strength of 500 psi, and water absorption of 4% maximum.

H. **Bedding and Leveling Material:** ASTM C33 or AASHTO M43, #10 graded clean coarse concrete sand. Depth as indicated on Drawings.

I. **Concrete:** specified in Section 03 30 53.

J. **Mortar setting bed:** ASTM C270 Type M mortar, ASTM C270 proportions by volume. Minimum average compressive strength at 28 days of 2,500 psi.

K. **Mortar setting bed:** Sand-portland cement mortar gauged with liquid latex mortar additive, mixed 1 part portland cement, and 3 parts sand. Mix cement and sand dry. Add latex mortar additive as required to provide a damp paste mortar.

L. **Joint Fill:** Clean concrete sand or mason sand.

M. **Grout:** Sand-portland cement dry mixture, mixed 1 part white portland cement and 3 parts fine sand with mineral oxide pigment added.

N. **Mortar:** Type M mortar, ASTM C270 proportions by volume. Minimum average compressive strength at 28 days of 2,500 psi.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and installation conditions. Do not start unit paving work until unsatisfactory conditions are corrected.

B. All proposed grades on the Drawings have been calculated to achieve desired drainage and visual effect; the Contractor shall verify existing elevations and grades and notify the Landscape Architect if the existing conditions vary from the existing conditions shown by the Drawings and the desired effect cannot be achieved.

3.2 PREPARATION

A. **Subgrade preparation:** Provide compacted subgrade to the lines and grades indicated on the Drawings as specified in Section 31 22 00.

B. **Base Course:** Install base course as specified in Section 32 11 00.

C. **Concrete Base:** Install concrete base as specified in Section 03 30 53.

D. Do not use paving units with chips, cracks, voids, discolorations, or other visible defects.

E. Cut paving units with masonry saws to provide clean, sharp unchipped edges. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full units without cutting wherever possible. Where cutting is required, use the largest size units possible. Avoid the use of small pieces of brick or large joint spaces.
F. Set unit pavers in patterns indicated with level surface and uniform joints of width indicated on Drawings. Tolerances shall be as follows:

1. **Joint spacing:** joints shall be between 0 inches and 1/2 inch.

2. **Smoothness:** shall not exceed 1/8" in 2'-0" and 1/4" in 10'-0" from straightedge laid on paving surface.

G. Layout paving units in advance of final placement for accurate spacing of surface bond patterns, with uniform joint widths, and to properly locate openings and pattern intersections.

H. Masonry Borders:

1. Install masonry borders as indicated on Drawings. When adjacent to concrete paving install borders prior to placing concrete paving. Set borders in concrete bed. Cover masonry borders with 2 – 3 mil visqueen plastic and overlap 12" into form area prior to placing concrete.

2. Curved Borders: Lay masonry units against wood or masonite formwork to create smooth curve transitions from curve to curve or from curve to straight line. Mortar joints in curve may vary from 1/4" to 3/4" in a single joint to achieve a smooth curve. Bricks shall be cut, if necessary, to stay within above tolerances and achieve the desired curve. Remove forms upon completion.

3.3 INSTALLATION: MORTARLESS PAVING.

A. Clean concrete base. Remove dirt and debris.

B. Install ½" dry mix, leveling bed, screen level lightly and tamp leveling bed.
   * Dry mix to be 4 part Mason’s sand to 1 part Portland cement, thoroughly mix prior to placement.

C. Set brick pavers with hand tight joints. Make joints between paving units from 0" to maximum of 1/8".

D. Sweep dry mix over the surface to fill joint irregularities.

E. Damp cure grout joint filler for minimum 3 days.

3.4 INSTALLATION: MORTARED PAVING.

A. Clean concrete base. Remove dirt, dust, debris, sealers, or curing compounds. Saturate with clean water before installing setting bed. Remove surface water.

B. Apply a thin mortar setting bed bond coat to the damp-dry concrete base surface prior to placing the setting bed. Limit area of bond coat to area, which will be immediately covered with setting bed material. Do not exceed 1/16" thickness of bond coat.

C. Install the mortar setting bed. Provide a damp packed mix with only enough water to produce a moist surface when setting bed is ready for paver installation. Spread and screed to a uniform thickness, level in plane, or uniformly sloped for drainage as indicated. Rod and compact with a steel trowel. Mix and place only the amount, which can be covered with paver prior to initial set of bed. Cut back and discard setting bed material, which has reached its initial set prior to placing paver units.

D. Wet pavers as required before setting. Do not install paver with free water on surface.

E. Trowel or brush apply a 1/16" bond coat to the setting bed. Set paver in wet bond coat. Tamp and beat paver with a wooden block to produce a level surface and to embed the paver in the setting bed.
F. Grout joints as soon as possible after initial set of mortar setting bed. Wet dry joint surfaces prior to grouting. Fill joints solid and free of voids; strike flush and tool slightly concave. Maintain 3/8" mortar joints, except for minor variations to maintain bond alignment.

G. Remove excess grout from face of paver as work progresses. Remove spillage while grout is fresh.

H. Damp cure grout for minimum of 7 days.

3.5 PROTECTION

A. Restrict traffic from brick paving surfaces during setting of units and for at least 48 hours after installation.

B. Protect brick paving from damage until final acceptance.

3.6 CLEANING

A. Remove and replace brick paving units which are broken, chipped, stained, or otherwise damaged. Provide new matching units, install as specified and to eliminate evidence to replacement.

B. Clean brick paving not less than 6 days after completion of work using clean water, trisodium phosphate, and stiff-bristle brushes. Do not use wire brushes, acid type cleaning agents, or other cleaning compounds with caustic or harsh fillers. Proprietary cleaning agents subject to Landscape Architects approval prior to use.

C. Remove plastic protective sheeting by cutting and removing. Use blow torch on edges to remove all trace of plastic above pavement surface

D. Perform cleaning during installation of work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from brick paving operations.

END OF SECTION 32 14 16
SECTION 32 25 00

EROSION AND SEDIMENTATION CONTROLS
SEEDING AND EROSION CONTROL MEASURES
SCDOT SUPPLEMENTAL SPECIFICATIONS

In addition to the erosion control measures specified in the Standard Specifications, the plans and these Special Provisions, the contractor is advised that all land disturbing activities (clearing and grubbing, excavation, borrow and fill) shall be subject to the requirements set forth in the following:

A. South Carolina Regulation 63-380, Standard Plan for Erosion, Sediment and Storm Water Runoff Control. (Regulation may be viewed at http://www.scstatehouse.net/)

B. Erosion and Sediment Reduction Act of 1983 (Title 48, Chapter 18 of the South Carolina Code of Laws of 1983, as amended). Section 70 of this code authorized the South Carolina Department of Health and Environmental Control (SCDHEC) to administer this regulation with respect to lands under the jurisdiction of the South Carolina Department of Transportation. (Code may be viewed at http://www.scstatehouse.net/code/t48c018.htm).

C. National Pollutant Discharge Elimination System (NPDES) General Permit Number SCR100000, effective February 1, 1998: The Environmental Protection Agency, in accordance with the Federal Clean Water Act, has granted to the South Carolina Department of Health and Environmental Control (DHEC) the authority to administer the Federal NPDES permit program in the state of South Carolina. (Permit may be viewed at http://www.scdhec.net/eqc/water/pubs/gr100000.pdf).

The General Permit listed in (3) above requires the Contractor to sign a certification statement (shown in part IV.E.2 of the General Permit). This certification has been incorporated into the proposal form for this contract. By signing the proposal form, the contractor acknowledges that upon award and execution of the contract he will become a co-permittee of the NPDES General Permit and is accountable to ensure the terms and conditions of the NPDES general permit are implemented. In addition, the contractor must certify that the NPDES certification statement and co-permittee status will be made part of all subcontracts.

The Contractor shall submit a Storm Water Pollution Prevention Plan (SWPPP) to the Engineer at the time of the preconstruction Conference. This plan shall meet the requirements of the NPDES General permit, and shall be reviewed and approved by the SCDOT prior to any land disturbing activities. Upon approval of the SWPPP, the Engineer will complete and forward a Notice of Intent (NOI) to the Department of Health and Environmental Control. The NOI must be submitted 48 hours prior to the beginning of any land disturbing activities.

Once approved, the SWPPP shall be fully implemented. The contractor shall coordinate the prompt installation of erosion control devices with construction activities in order to maintain compliance with the above regulations and NPDES general permit.

The contractor shall coordinate the prompt installation of erosion control devices with construction activities in order to maintain compliance with the above.

Erosion and sediment control inspections will be conducted every 7 calendar days and within 24 hours of the end of a storm that is 0.5 inch or greater. Representatives of the Department and the Contractor shall both participate in these inspections and shall acknowledge participation in the inspection by signing the inspection report. Deficiencies noted during these inspections shall be corrected within 7 calendar days. If deficiencies are not corrected within this timeframe, they shall be cause for stoppage of all contract work (except erosion and sediment control measures) until the deficiencies are corrected.

The contractor is advised that special attention must be given to critical areas within the project limits (i.e., running streams, water bodies, wetlands, etc.). In these areas, the Engineer may direct the contractor to undertake immediate
corrective action, but in no case shall these deficiencies remain unresolved more than 7 days after being identified during the Erosion and Sediment Control inspection.

The seeding operations shall closely follow the grading operations. The slopes shall be shaped and prepared for seeding as the grading progresses. Unless prior written approval is granted by the Engineer, the amount of surface area exposed by land disturbing activities shall be limited to 750,000 square feet. Seeding operations shall commence within 7 days following completion of construction activities within an area.

If construction activities are to be temporarily suspended within an area for a period of 21 days or longer, temporary vegetation shall be placed within seven 7 days following the last construction activity in that area.

The contractor shall coordinate the installation of all other permanent erosion control items with the grading and seeding operations. These items include, but shall not be limited to, asphalt gutter and rip rap. Gutter work shall be constructed prior to or promptly after the seeding is performed. Rip rap shall be placed at ends of pipe immediately after the pipe is laid and rip rap ditch checks shall be installed promptly after ditch work has been performed.

Failure to adequately comply with the provisions as detailed above or any other required erosion control measures will result in stoppage of all contract operations (except erosion and sediment control measures) until corrective action has been taken. Additional sanctions may be invoked by the SCDHEC in accordance with their authority.

Fines assessed by these agencies to the Department as the result of the Contractor’s noncompliance or violation of said permit provisions will be paid by the Department and subsequently deducted from the Contractor’s monthly pay estimate.

END OF SECTION 32 25 00
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes piping, valves, sprinklers, controls and wiring for automatic control irrigation systems.

B. Extent of the underground irrigation system is shown in the plans, schedules and notes.

C. Provide all labor. Materials and equipment required or inferred from the Drawing and Specifications to complete the Work of this Section.

D. Provide a complete and operable system for the irrigation of all landscapes areas on the project site, unless indicated otherwise. The Drawings and specifications are intended to include all items obviously necessary and requisite for the proper irrigation of the project.

E. The contractor shall be responsible for adjusting head locations, nozzle type and size, and any other system components so that the irrigation system layout is coordinated with actual field conditions. Such adjustments shall be made at no cost to the Owner except, when authorized in writing, such adjustments which will be compensated for at an agreed upon cost.

1.3 DEFINITIONS

A. Lateral Piping: Downstream from control valves to sprinklers, specialties, and drain valves. Piping is under pressure during flow.

B. Drain Piping: Downstream from circuit-piping drain valves. Piping is not under pressure.

C. Mainline Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.

D. The following are industry abbreviations for plastic materials:

2. FRP: Fiberglass-reinforced plastic.
3. PA: Polyamide (nylon) plastic.
4. PE: Polyethylene plastic.
5. PP: Polypropylene plastic.
6. PTFE: Polytetrafluoroethylene plastic.
7. PVC: Polyvinyl chloride plastic.
8. TFE: Tetrafluoroethylene plastic.
9. HDPE: High Density Polyethylene plastic.
1.4 PERFORMANCE REQUIREMENTS

A. Head to head coverage irrigation system for lawns and exterior plants as shown or indicated on associated plans.

B. Drawings are diagrammatic and generally indicate the Work to be installed. The Drawings do not indicate all off-set fittings that may be necessary. The Contractor shall furnish such items as may be required to complete the work.

C. Location of Sprinklers and Specialties: Design location is approximate. Make minor adjustments necessary to avoid plantings and obstructions such as signs and light standards. Maintain 100 percent irrigation coverage of areas indicated.

D. Minimum Working Pressures: The following are minimum pressure requirements for piping, valves, and specialties unless otherwise indicated:

1. Irrigation Main Piping: 200 psi.
2. Lateral Piping: 200 psi.

1.5 SUBMITTALS

A. Approval: Obtain approval from Landscape Architect for all submittals prior to the beginning of Work, unless otherwise approved.

B. Product Data: Individual copies for product data shall be submitted with each product identified within the data by highlighting, circling or other method of identification. Include pressure ratings, rated capacities, and settings of selected models, if applicable, for the following:

1. Electrical Control Valves.
2. Quick Coupler Valves.
3. Isolation Valves.
4. Valve boxes.
5. Sprinklers.
6. Controllers and associated communication equipment.
7. Control cables. Include splice kits.
8. Decoders.
9. Grounding equipment.
10. Master Valve
11. Flow Sensor
12. PVC fittings.
13. PVC Primer and Cement.
15. Mainline and Lateral pipe fittings.
16. Inline Drip Tubing and Fittings.

C. As-Built Drawings: Any changes in the layout and or arrangements of the proposed irrigation system, or any other differences between the proposed system and actual installed conditions are to be recorded by the Irrigation Contractor in the form of an “As-Built” Drawing. As-Built Drawing to be produced in an electronic format using AutoCAD. Provide the Owner and the Landscape Architect and AutoCAD & PDF file along with five (5) hard copies of the As-Built Drawings before Work under this Contract will be considered for Acceptance. All automatic and manual valves, hose bibs or quick couplers, wire splice, and pressurized mainline locations shall be show with actual field dimensions in feet and inches from tow
permanent reference points so they may be located easily in the field. Submittals of approved As-Built Drawing will precede any Application for Final Payment by the Contractor.

D. Operation and Maintenance Data: For irrigation systems, to include in emergency, operation, and maintenance manuals, including data for the following:

1. Automatic control valves.
2. Isolation valves.
4. Control systems.

E. Test Reports: Field test results of the irrigation supply well to include flow rates, and recovery rates.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage a firm or firms specializing in irrigation system installation. Installer shall have successfully completed five 2 wire control system projects similar in material, size, scope and complexity to that indicated for this Project that have resulted in construction with a record of successful in-service performance.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a qualified testing agency, and marked for intended use.

C. Codes and Standards: Perform the work in compliance with applicable requirements of governing authorities having jurisdiction. County regulations supersede these specifications. Notify Landscape Architect in writing of all discrepancies immediately.

D. Approval and Selection of Materials and Work: The selection of all materials and the execution of all operations required under the Drawings and Specifications is subject to the approval of the Owner and Landscape Architect. The have the right to reject any and all materials and any and all work which, in their opinion, does not meet the requirements of the Contract Documents at any state of the operations. Remove rejected Work and or materials from the project site and replace promptly.

E. Do Not Make Substitutions: If the Contractor desires to make substitutions of materials, sufficient descriptive literature and material samples must be furnished to establish the material as an equal substitute. In addition, the Contractor must state his reasons for desiring substitute materials and any potential cost savings. Submit this request and information to the Landscape Architect.

1.7 DELIVERY, STORAGE, AND HANDLING

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

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

1.8 PROJECT CONDITIONS

A. The irrigation system is designed to operate under the following conditions. A minimum of 50 psi water pressure at the tap, and at least a 21 gpm available water supply.
B. Insurance on irrigation materials or equipment stored or installed is the responsibility of the Contractor. Such insurance shall cover fire, theft and vandalism. Should the Contractor elect not to provide for such insurance, he will in no way hold the Owner responsible for any losses incurred by the aforementioned acts. The Contractor is responsible for all costs incurred in replacing damaged or stolen materials or equipment prior to Substantial Completion of the Work.

C. Obtain all required permits and pay all required fees, at no additional cost to the Owner. Any penalties imposed due to the failure to obtain permits or pay fees are the responsibility of the Contractor.

D. Provide and maintain all passageways, guard fences, warning lights and other protective devices required by the local authorities.

E. Existing grades: Existing grades will be within .2 feet of grades shown on the Civil Engineering Drawings at the time of work. Determine conditions of existing grades prior to beginning the Work. When irregular or incomplete grading conditions are encountered, notify the Owner in writing before beginning the Work. Determine location of existing drainage patterns and maintain patterns in completed Work. Perform Work in a manner which will avoid damage to finished grading and drainage patterns. All damage to finished grading and drainage resulting from Work covered in these Contract Documents shall be repaired at the Contractor’s expense.

F. Existing Utilities: Determine location of underground utilities. Perform Work in a manner which will avoid possible damage. Excavate as required. Maintain grade stakes set by other unless removal is mutually agreed upon by parties concerned. All damage to utilities resulting from Work covered in these Contract Documents shall be repaired at the Contractor’s expense.

G. Existing Conditions: Perform irrigation Work in Tree Protection zones and in existing or previously completed landscape areas to avoid damage and disturbance to these areas. Limit work in these areas to only that necessary to perform work specified herein and shown on the Drawings. Return and repair any areas damaged or disturbed while performing the Work to the existing conditions encountered prior to the Work.

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

1. Notify Owner’s Representative no fewer than two (2) days in advance of proposed interruption of water service.
2. Do not proceed with interruption of water service without Owner’s Representative’s written permission.

I. Removal of Hardscape: Do not remove hardscape surface unless permitted under the following conditions:

1. Coordinate with Owner’s Representative no fewer than two (2) days in advance of proposed hardscape removal.
2. Hardscape removal must not interrupt normal traffic flow on hardscape area.
3. Area of removal must be usable prior to close of work day and completely repaired within 2 days of removal.

1.9 COORDINATION

A. Coordinate installation of irrigation system with Owner’s Representative and/or all other trades on site to insure irrigation system or other work on site will not be damaged. Should contractor fail to coordinate and damages occur it will be the contractor’s responsibility to repair damages at his own costs.
1.10 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents:

1. Rotary Sprinkler Units: Equal to two (2) percent of amount installed for each type and size indicated, but no fewer than 10 units.
2. Spray Sprinkler Units: Equal to two (2) percent of amount installed for each type and size indicated, but no fewer than 10 units.
3. Electric Control Valve Units: Equal to five (5) percent of amount installed for each type indicated, but no fewer than ten (5) units of each size and type.
4. Isolation Valves: Equal to five (5) percent of amount installed for each type indicated, but no fewer than two (2) units of each type.
5. Inline Drip Tubing: 100LF of each type of inline drip tubing used on the site.

1.11 PRE-INSTALLATION MEETING

A. Conduct a conference/meeting at the Project site. Review methods and procedures related to the site landscape irrigation system including, but not limited to the following:

1. The General Contractor is to contact the Irrigation Consultant and Owner Representative a minimum of 60 days prior to the schedule date of commencement of the irrigation installation.
2. Meet with Owner Representative and Irrigation Consultant to review Contract documents.
3. Verify current drawing release date with contractor’s documents.
4. Review submittal procedure including codes, substitutions, product data, qualifications, and As-Built procedures and formats.
5. Review project conditions including tap & meter Size, permits, utility locations and water conditions.
6. Review methods and procedures related to irrigation installation.
7. Review and finalize construction schedule and verify availability of materials, contractor’s personnel, equipment, and facilities needed to make progress and avoid delays.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

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

2.2 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, Schedule 40, Type S or E, Grade A or B, galvanized with threaded ends.

B. Soft Copper Tube: ASTM B 88, Type L, water tube, annealed temper.
   3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

C. Hard Copper Tube: ASTM B 88, Type L, water tube, drawn temper.
   3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

   1. PVC Socket Fittings, Schedule 40: ASTM D 2466, 3” and smaller
   2. PVC Threaded Fittings: ASTM D 2464.

2.3 GENERAL DUTY VALVES

A. AWWA, Cast-Iron Gate Valves: AWWA C509, resilient-wedge nonrising-stem, gray- or ductile-iron body and bonnet gate valve, epoxy coated; with steel stem and 2”operating nut.
   2. End Connections: Mechanical join flanged or ring-tite.
   4. Manufacturers:
      a. Matco.
      b. Leemco.
      c. Approved Equal.

B. Isolation Valve Boxes: Ten inch circular valve box with 6” SDR 21 PVC pipe riser from top of valve to center line of valve box. Pipe to be centered on operating nut to allow easy access.
   1. Operating Wrenches: Furnish total of two (2) steel, tee-handle operating wrenches with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

C. Bronze Gate Valves: MSS SP-80, Class 125, Type 1, non-rising stem, bronze body with solid wedge, threaded ends, and malleable-iron hand wheel.
   1. Manufacturers:
a. NIBCO, Inc.
b. Approved Equal.

2.4 SPECIALTY VALVES

A. Quick-Couplers: Factory-fabricated, bronze or brass, two-piece assembly. Include coupler water-seal valve; removable upper body with spring-loaded or weighted, rubber-covered cap; hose swivel with ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet; and operating key.

1. Locking-Top Option: Vandal-resistant, locking feature. Include four matching keys with hose swivel for each key.
2. Manufacturers:
   a. Rain Bird.
   b. Or Approved Equal

2.5 CONTROL VALVE BOXES

A. Plastic Control-Valve Boxes: Box and cover, with open bottom and openings for piping; designed for installing flush with grade. Size for all valves to be standard 14” rectangular.

1. Shape: Rectangular.
2. Sidewall Material: ABS or HDPE.
3. Cover Material: ABS or HDPE.
   a. Lettering: IRRIGATION.
   b. Green in color.
   c. Lockable with hex key mechanism or similar.
4. Manufacturers:
   a. Rain Bird.
   b. Or Approved Equal.

2.6 SPRINKLERS

A. Description: Plastic housing and corrosion-resistant interior parts designed for uniform coverage over entire spray area indicated, at available water pressure.

1. Manufacturers: :
   a. Rain Bird
   b. Hunter Industries for the MP Rotator nozzles.
   c. Or Approved Equal.

2. Pop-up Spray Sprinklers: Fixed or adjustable pattern with screw-type flow adjustment, stainless-steel retraction spring, drain check valve, pressure regulation, co-molded riser seal that seals cap to body and pop-up heights of 6”, 12”.

IRRIGATION SYSTEMS
3. Pop-up, Rotary Sprinklers: Gear drive, full-circle and adjustable part-circle types with screw-type flow adjustment, stainless-steel retraction spring, stainless-steel riser, drain check valve, flow stop valve, minimum of 8 nozzles available, integral rubber cover, adjustable from the top of the sprinkler and pop-up heights of 6”, 12”.

2.7 ELECTRIC CONTROL VALVES

A. Description: Electrically controlled hydraulically actuated control valves.

1. Manufacturers:
   a. Rain Bird.
   b. Or Approved Equal.

2.8 AUTOMATIC CONTROL SYSTEM

A. Manufacturers:

1. Rain Bird.
2. Or Approved Equal.

B. Exterior Control Enclosures: NEMA 250, Type 4, weatherproof, with locking cover and two matching keys; include provision for grounding.

1. Material: Enameled-steel or stainless steel.

C. Control Transformer/Decoder Output: 24VAC 4A secondary, with overload protection and or primary fuse.

1. Decoder Line Output: 32 VAC RMS over 2-wire path
2. Solenoid Capacity: 2 standard 24VAC solenoids per output, maximum output of 15 simultaneously.

D. Controller Stations for Automatic Control Valves: Each station is variable from approximately 1 minute to 23.9 hours. Include switch for manual or automatic operation of each station.

E. Timing Device: Adjustable, 24-hour, 365 day clock, with automatic operations to skip operation any day in timer period, to operate every other day, odd-even days, interval days, to operate 8 or more times daily.

1. Manual or Semi-automatic Operation: Allows this mode without disturbing preset automatic operation.
2. Minimum 30 day internal power storage: Automatically powers timing device during power outages.
3. Eight (8) start times.
4. Simultaneous program operation.
5. Test program.
6. One button manual start.
7. Seasonal adjust 25% to 200%.
8. Internal self-diagnostics of controller, bicos and solenoids.
9. Ten (10) independent programs.
10. Surge Protection: Metal-oxide-varistor type on each station and primary power.
11. Climate Sensor compatible with over-ride capabilities.
12. Remote control capabilities.

F. Wiring:

1. Manufacturers:
   a. Rain Bird
   b. Or Approved Equal

2. Feeder-Circuit Cables: No. 14 AWG minimum, between building and controllers.
4. Splicing Materials: 3M DBR-Y6 as required by manufacturer.

2.9 DRIP IRRIGATION SPECIALTIES

A. Drip Irrigation Emitters: Inline self-cleaning, pressure compensating variety with individual check valves as indicated. In-line emitters will be spaced as per Irrigation Schedule on center. Manual flush valves will be required at all locations necessary for maintenance flush and winterization blow out to assure water has been evacuated prior to freezing temperatures that would cause damage to the tubing or inline emitters.

1. Acceptable Manufacturers:
   a. Rain Bird XFCV
   b. Or Approved Equal

B. Drip Control Zone Kit: Electric control valve, in-line pressure regulator and wye or disc filter, pre-assembled by the manufacture, as shown in the irrigation schedule.

1. Acceptable Manufacturers:
   a. Rain Bird
   b. Or Approved Equal

C. Manual Flush Valves: All drip zones shall be installed with manual flush valve(s), number of valves will be based on the zone size and the number of dead ends.

D. Drip Tubes with Direct-Attach Emitters:

1. Tubing: Flexible PE with plugged ends
2. Emitters: Devices to deliver water at approximately 15 psi.
   a. Body Material: PE or vinyl, with flow control.
   b. Mounting: Inserted directly into tubing at set intervals, on emitter stake, on PE riser.

PART 3 - EXECUTION

3.1 GENERAL

A. Observation of Work in Progress: During the installation the Landscape Architect/Irrigation Consultant will make regular site visits and reject any work and materials which do not meet the requirements called for in the Contract Documents.
B. Inspect project site prior to start of Work to determine that all site conditions are acceptable for Work to begin. Inform Landscape Architect/Irrigation Consultant of unsuitable conditions. Do not proceed with installation of the irrigation system until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

C. Locate all existing underground utilities prior to trenching and/or boring operations and protect them against damage during the Work. Obtain utility location from Owner and/or General Contractor and utilize utility locating services when necessary.

3.2 EXAMINATION

A. Investigate and determine available water supply, water pressure and flow characteristics.

B. When unanticipated utilities that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Owner for action.

3.3 EARTHWORK

A. Install warning tape directly above pressure piping, 12 inches below finished grades, except 6 inches below subgrade under pavement and slabs.

B. Install piping and wiring in sleeves under sidewalks, roadways, parking lots, and railroads.

   1. Install piping sleeves prior to hardscape sub-base being installed if possible.
   2. Sleeveing installed in open trench to be completely backfilled crushed limestone, approved by owners representative and compacted to insure no future settling.
   3. Pipe sleeves are to be a minimum of two times the diameter of the pipe in the sleeve.

C. Provide minimum cover over top of underground piping according to the following:

   1. Irrigation Main Piping: Minimum depth of 18 inches from top of pipe to finished grade.
   2. Circuit Piping: 12 inches from top of pipe to finished grade within general landscape areas, piping to be a minimum of 3 inches laterally from mainline at all times.
   3. Drain Piping: 12 inches.
   4. Sleeves: 10 inches from top of pipe for mainlines and 10 inches from top of pipe for laterals.

3.4 EXCAVATION PREPARATION

A. Set stakes to identify locations of proposed irrigation system. Obtain Owner’s Representative’s approval before excavation.

B. Excavate area for pipe installation 4” wider than diameter of pipe.

   1. Level trench base to insure consistent contact of pipe to trench bottom.
   2. Remove all rocks and other sharp objects.
   3. Place pipe in trench snaking from side to side if possible.
   4. Backfill to the top of pipe compacting the sides.
   5. Backfill in 8” lifts compacting to 90% between lifts until complete.
   6. All trenches greater than 4” in width to be restored to grade, +− ¼”, with sod as approved by Owner’s Representative.
7. All trenches 4” or small in width to be restored to grade, +/− ¼” with a minimum of 3” of topsoil as approved by Owner’s Representative.
8. Whenever possible trenching should be outside of a tree dripline. If trenching is done within the dripline it should be at least 10’ from existing tree, if 10’ is not possible the trenching must be done by hand and all tree roots greater than 1” to be left in place. All tree roots 1” or less may be removed by saw cutting root on either side of the excavation and root removal.

3.5 PIPING APPLICATIONS

A. Install components having pressure rating as shown on the plan.
B. Piping above ground may be joined with flanges instead of joints indicated.
C. Aboveground Irrigation Main Piping: Use the following piping materials for each size range:
   1. NPS 3 and Larger: Steel pipe; malleable-, gray-, or cast-iron fittings; and threaded joints.
   2. NPS 25 and Smaller: Hard copper tube, wrought- or cast-copper fittings, and soldered joints.
D. Underground Irrigation Main Piping: Use the following piping materials for each size range:
   1. NPS 25 and Smaller: SCH 40, PVC, pressure-rated pipe; Schedule 40, PVC socket fittings; and solvent-cemented joints.
   2. NPS 3 and larger: SCH 40, pressure rated pipe with gasket joint ends, Ductile Iron gasket joint fittings with manufacturer’s recommended joint restraint.
E. Circuit Piping: Use the following piping materials for each size range:
   1. NPS 4 and Smaller: SCH 40, PVC, pressure-rated pipe; Schedule 40, PVC socket fittings; and solvent-cemented joints.
F. Underground Branches and Offsets at Sprinklers and Devices:
   1. Option: Plastic piping manufactured for this application may be used on sprinkler inlets of 1/2” or smaller instead of pipe and fittings specified, “swing pipe and spiral barbed elbows”. If this is to be used the offset must be more than 12” and less than 18” as per detail.
G. Risers to Aboveground Sprinklers and Specialties: Type L hard copper tube, wrought-copper fittings, and soldered joints.
H. Sleeves: SCH 40 PVC pipe and socket fittings; and solvent-cemented joints.
I. Transition Fittings: Use transition fittings for plastic-to-metal pipe connections according to the following:
   1. Couplings:
      a. Underground Piping NPS 2-1/2 and Smaller: Manufactured fitting or coupling.
      b. Underground Piping NPS 3 and Larger: PVC Flange with stainless steel bolts and rubber gasket.
   2. Fittings:
      b. Underground Piping: Union with plastic end of same material as plastic piping.
J. Dielectric Fittings: Use dielectric fittings for dissimilar-metal pipe connections according to the following:

1. Underground Piping:
   a. NPS 2 and Smaller: Dielectric coupling or dielectric nipple.
   b. NPS 2-1/2 and Larger: Prohibited except in control-valve box.

2. Aboveground Piping:
   a. NPS 2 and Smaller: Dielectric couplings or dielectric nipples.
   b. NPS 2-1/2 to NPS 4: Dielectric flange.

3. Piping in Valve Boxes or Vaults:
   a. NPS 2 and Smaller: Dielectric union.
   b. NPS 2-1/2 to NPS 4: Dielectric flange.

3.6 VALVE APPLICATIONS

A. Aboveground, Shutoff-Duty Valves:

   1. NPS 2-1/2 and Smaller: Bronze gate valve.
   2. NPS 3 and Larger: Cast-iron, non-rising stem gate valve.

B. Isolation Valves:

   1. NPS 2-1/2 and Smaller: Bronze non-rising stem gate valve.
   2. NPS 3 and Larger: Cast-iron, non-rising stem gate valve with 2” operating nut.

3.7 PIPING INSTALLATION

A. Location and Arrangement: Drawings indicate location and arrangement of piping systems. Install piping as indicated unless deviations are approved on Coordination Drawings.

B. Install piping free of sags and bends.

C. Install groups of pipes parallel to each other with a space between minimum of 4”, spaced to permit single valve removal and or servicing.

D. Install fittings for changes in direction and branch connections.

E. Install dielectric fittings to connect piping of dissimilar metals.

F. Install underground thermoplastic piping according to ASTM D 2774 and ASTM F 690.

G. Lay piping on solid sub-base, uniformly sloped without humps or depressions.

H. Install PVC piping in dry weather when temperature is above 32 deg F. Allow joints to cure at least 24 hours at temperatures above 32 deg F before testing unless otherwise recommended by manufacturer.
I. Install water regulators with shutoff valve and strainer on inlet and pressure gage on outlet. Flush the line prior to installation to remove debris. Install the valve so that the flow arrow marked on the valve body tag corresponds to the flow through the line. Install shutoff valve on outlet.

3.8 VALVE INSTALLATION

A. Electrical Control Valves: Install in valve box with top flush with and perpendicular to grade.
   1. Electrical control valve boxes to be 14” rectangular valve box for standard valves and “Jumbo” valve boxes for drip zone kits.
   2. From bottom of valve to a depth of 6” install washed stone or gravel sized between ¾” and 1” in diameter to create sump and stabilize valve box.
   3. Install valve box extensions as necessary to bring lid level with finished landscape grade.
   4. Control Valves to be installed with center line of valve 12” below finished grade.

B. Underground, Manual Control Valves: Install with 6” SDR 21 PVC riser from top of pipe to center line of valve box finishing with 10” round valve box level with finished landscape grade.
   1. Install valves and PVC pipe with restrained, gasketed joints as necessary at the same depth as the mainline pipe.

3.9 SPRINKLER INSTALLATION

A. Flush circuit piping with full head of water prior to installing sprinklers.

B. Install sprinklers at manufacturer’s recommended heights perpendicular to grade.

C. Locate part-circle sprinklers to maintain a minimum distance of 4 inches from walls and 2 inches from other boundaries unless otherwise indicated.

D. Adjust all sprinklers to irrigated plant material indicated for the station.

3.10 AUTOMATIC CONTROL SYSTEM INSTALLATION

A. Obtain approval of controller location from owner’s representative prior to installation. Install wall mount controllers approximately 48” -60” above FFE. Securely fasten controller to wall with metallic fasteners appropriate for wall type or install pedestal controller on concrete pad with all necessary conduit installed through the pad to accommodate all wire to controller. All irrigation control wire between controller and control valves to be in 1” SCH 40 PVC electrical conduit.

B. Install control wire conduit in same trench as mainline piping and at least 4 inches to the side of the piping. Provide conductors of size not smaller than recommended by controller manufacturer. All wire splices not in a valve box to be located in minimum 10” round valve box.

3.11 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.
B. Ground equipment according to ASIC Grounding Guidelines www.aisc.org. Resistance readings to ground to be as recommended by the manufacturer. If there are no manufactures requirements then the controller should have a resistance of 10 ohms or less.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.12 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
4. Remove and replace units and retest and re-inspect as specified above.

3.13 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service of control system.

B. Verify that controllers are installed and connected according to the Contract Documents.

C. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements in Division 16 Sections.

D. Complete startup checks according to manufacturer's written instructions.

3.14 ADJUSTING

A. Program controller(s) to insure adequate moisture is available for the root zone of the plant. Insure there is no run-off, over watering or deep percolation. Insure controller operates within irrigation window as defined by Owner’s Representative or local governing authorities. See additional controller programming notes on plans provided.

B. Adjust automatic control valves to provide flow rate at rated operating pressure required for each sprinkler circuit. Use pressure regulation for each control valve if pressure is higher than recommended for the sprinklers in the circuit.

C. Adjust sprinklers so they will be 1/8 inch above finish grade in sodded lawns and 1/2 inch above grade in seeded lawns. In shrub beds adjust sprinklers to insure top of sprinkler is at finished mulch levels.

D. Adjust sprinklers arc and radius to insure no water is sprayed outside of the irrigated area.

3.15 CLEANING

A. Flush dirt and debris from piping before installing sprinklers and other devices.
3.16 DEMONSTRATION

A. It is contractors’ responsibility to train Owner's maintenance personnel to adjust, operate, and maintain sprinklers, isolation valves, controllers and automatic control valves.

3.17 OBSERVATION AND ACCEPTANCE

A. Periodic site visits will be made by the Landscape Architect\Irrigation Consultant to review the quality and progress of the work. Work found to be unacceptable must be corrected within five (5) calendar days. Remove rejected materials promptly from the project.

B. Upon completion of the Work, the Contractor shall notify the Landscape Architect and Owner at least ten (10) days prior to requested date of the site visit for Substantial Completion of all portions of the Work. Landscape Architect\Irrigation Consultant will issue a punch list for all work to be corrected. All work on the punch list must be complete within five (5) working days from the date of the site visit. Where Irrigation Work does not comply with the requirements, replace rejected Work. If such replacements are not completed within the time specified, the Irrigation Contractor may be considered to be in default of the Contract, and the Owner may use the Contract Retainage to hire other Contractors to finish the work.

C. It will be the responsibility of the Irrigation Contractor to provide reliable communication system (remote control or two way radios) for Substantial Completion and all periodic site visits.

D. If a site visit to verify Substantial Completion has been scheduled and the Landscape Architect\Irrigation Consultant arrives at the site and determines that the irrigation system is not substantially complete (all system components in place, operational and checked) the Contractor will be responsible for all expenses included but are not limited to the following: mileage, airfare, consultant’s time, parking fees, meals, car rental, etc. All incurred expenses will be deducted from the final contract amount.

END OF SECTION 328400
PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Soil Preparation.
   2. Planting mixes.
   3. Trees, shrubs, and groundcovers.
   4. Mulch and planting accessories.
   5. Maintenance of Trees, Shrubs, and Groundcovers.

B. Related Sections:
   1. Division 1: General Requirements
   2. Section 31 22 00: Earthwork

1.2 REFERENCES


C. Standards of Practice of the American Association of Nurseriesmen.

D. All standards shall include the latest additions and amendments as of the day of the advertisement for bids.

1.3 QUALIFICATIONS

Landscape planting and related work shall be performed by a firm with a minimum of five years experience specializing in this type of work. All contractors and their sub-contractors who will be performing any landscape work included in this section of the specification shall be approved by the landscape architect.

1.4 SUBMITTALS

A. Quality Control Submittals:
   1. Submit the following materials certification:
      a. Plant fertilizer(s) analysis.
   2. Submit subsurface investigation reports.
3. Submit photographs of "specimen" plant materials.

B. Contract Closeout Submittals:
   A. Prior to plant material acceptance, submit written maintenance instructions recommending adequate and reasonable procedures for maintenance of plant materials.
   
   B. Provide plant material record drawings:
      1. Legibly mark drawings to record actual construction.
      2. Indicate horizontal locations, referenced to permanent surface improvements.
      3. Identify field changes of dimension and detail and changes made by Change Order.

1.5 QUALITY ASSURANCE
   A. Provide stock true to botanical name and legibly tag plants with botanical name to include variety or cultivar and size in accordance with the Standards of Practice of the American Association of Nurserymen.
   
   
   C. Plants may be inspected and approved at the place of growth, for compliance with specification requirements for quality, size, and variety.
      1. Such approval shall not impair the right of inspection and rejection upon delivery at the site or during the progress of work.
   
   D. Qualifications: Planting shall be performed by experienced workers familiar with planting procedures.

1.6 DELIVERY, STORAGE, AND HANDLING
   A. Deliver fertilizer materials in original, unopened, and undamaged containers showing weight, analysis, and name of manufacturer. Store in manner to prevent wetting and deterioration.
   
   B. Moving and Storage of Plant Materials: Take all precautions customary in good trade practice in preparing plants for moving. Workmanship that fails to meet the highest standards will be rejected.
      1. Dig, pack, transport, and handle plants with care to ensure protection against injury. Fully protect plants from damage by sun, wind, drought, water and other injurious conditions during transportation to site and during temporary storage before planting.
      2. Inspection certificates required by law shall accompany each shipment invoice or order to stock and on arrival, the certificate shall be filed with the Landscape Architect.
      3. No plant shall be bound with rope or wire in a manner that could damage or break the branches.
1.7 PROJECT CONDITIONS

A. Protect existing utilities, paving, and other facilities from damage caused by landscaping operations.

B. The irrigation system will be installed prior to planting. Locate, protect, and maintain the irrigation system during planting operations. Repair irrigation system components, damaged during planting operations, at Contractor's expense.

1.8 SCHEDULING

A. Time of Planting: Plant under favorable weather conditions and recommended season for survival and establishment. At option of, and under full responsibility of Contractor, planting operations may be conducted under unseasonable conditions, but without additional compensation.

1.9 WARRANTY

A. Warrant plant material to remain alive and be healthy, vigorous condition for a period of one year after final acceptance of entire project.

B. Contractor's Inspection of Owner's Maintenance:

1. During Warranty Period, Contractor shall make periodic visits to site (especially during times of unusually severe weather conditions) to inspect plants installed and guaranteed by him. If he should determine that conditions such as Owner's maintenance, which are not directly under his control, are insufficient to sustain plants, he shall promptly file written notice with Owner and Landscape Architect stating his findings and recommendations for correction.

2. If Landscape Architect concurs with Contractor after inspection of site, or if he should not be authorized to promptly inspect the site at Owner's expense, Contractor then may file written notice with Owner and Landscape Architect that unless proper maintenance, or other necessary work has been completed by a reasonable given date, and sustained thereafter, the terms of Plant Warranty will become null and void for all or stated portions of the work.

C. Remove from site, promptly upon discovery during periodic visits, dead or other unsatisfactory plants. Mark location safely with stake to facilitate future replacement.

D. Replace, in accordance with the Drawings and Specifications, all plants that are dead or, as determined by the Landscape Architect, are in an unhealthy or unsightly condition, and have lost their natural shape due to dead branches, or other causes due to Contractor's negligence.

1. The cost of such replacement(s) is at Contractor's expense.

2. Replace during earliest favorable weather and season unless directed otherwise by Landscape Architect.

3. Warrant all replacements plants for 1 year after installation.

E. Warranty shall not include damage or loss of plants caused by fires, floods, freezing, rains, lightning storms, winds over 75 miles per hour, or winter kill caused by extreme cold and severe winter conditions not typical of planting area; acts of vandalism or negligence on the part of the Owner.

F. Failure to Remedy Defects: If Contractor fails to remedy any defects in workmanship, materials, or performance that he is responsible for within reasonable length of time as specified in notice from
Landscape Architect to Contractor, the Owner may have work done and charge the cost to the Contractor.

G. Satisfaction of Warranty:

1. Contractor shall request by written notice inspection of final acceptance to take place within one week before or after end of warranty period.

2. If plants are in satisfactory condition, the Contractor shall receive a written notice of Warranty Compliance.

3. Replace rejected work and continue maintenance until work is reinspected by Landscape Architect and found acceptable.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Plants shall be true to species and variety specified and nursery-grown in accordance with good horticultural practices under climatic conditions similar to those in the locality of the project for at least two years. They shall have been freshly dug (during the most recent favorable harvest season).

1. All plant names and descriptions shall be as defined in Hortus Third.

2. All plants shall be grown and harvested in accordance with the American Standard for Nursery Stock.

3. Unless approved by the landscape architect, plants shall have been grown at a latitude not more than 325 km (200 miles) north or south of the latitude of the project unless the provenance of the plant can be documented to be compatible with the latitude and cold hardiness zone of the planting location.

B. Unless specifically noted, all plants shall be of specimen quality, exceptionally heavy, symmetrical, and so trained or favored in development and appearance as to be unquestionably and outstandingly superior in form, compactness, and symmetry. They shall be sound, healthy, vigorous, well branched, and densely foliated when in leaf; free of disease and insects, eggs, or larvae; and shall have healthy, well-developed root systems. They shall be free from physical damage or other conditions that would prevent vigorous growth.

1. Trees with multiple leaders, unless specified, will be rejected. Trees with a damaged or crooked leader, bark abrasions, sunscald, disfiguring knots, insect damage, cuts of limbs over 20 mm (3/4 in.) in diameter that are not completely closed or flush pruning cuts that do not preserve the collar at the base of the branch will be rejected.

C. Plants shall conform to the measurements specified, except that plants larger than those specified may be used if approved by the landscape architect. Use of larger plants shall not increase the contract price. If larger plants are approved, the root ball shall be increased in proportion to the size of the plant.

1. Caliper measurements shall be taken on the trunk 150 mm (6 in.) above the natural ground line for trees up to and including 100 mm (4 in.) in caliper, and 300 mm (12 in.) above the natural ground line for trees over 100 mm (4 in.) in caliper. Height and spread dimensions specified refer to the main body of the plant and not from branch tip to branch tip. Plants shall be measured when branches are in their normal position. If a range of sizes is given, no plant shall be less than the minimum size, and no less than 50 percent of the plants shall be as large as the maximum size specified. Measurements specified are minimum sizes acceptable after pruning, where pruning is required. Plants that meet measurements but do not possess a standard relationship between height and spread, according to the American Standards for Nursery Stock, shall be rejected.
D. Substitutions of plant materials will not be permitted unless authorized in writing by the landscape architect. If proof is submitted in writing that a plant specified is not obtainable, consideration will be given to the nearest available size or similar variety, with a corresponding adjustment of the contract price.

E. The plant list at the end of this section, or on the drawing, is for the contractor's information only, and no guarantee is expressed or implied that quantities therein are correct or that the list is complete. The contractor shall ensure that all plant materials shown on the drawings are included in his or her bid.

F. All plants shall be labeled by plant name. Labels shall be attached securely to all plants, bundles, and containers of plant materials when delivered. Plant labels shall be durable and legible, with information given in weather-resistant ink or embossed process lettering.

G. Selection and Tagging
   1. Plants shall be subject to inspection for conformity to specification requirements and approval by the landscape architect at their place of growth and upon delivery. Such approval shall not impair the right of inspection and rejection during progress of the work.
   2. All field grown deciduous trees shall be marked to indicate the trees north orientation in the nursery. Place a 1-in. diameter spot of white paint onto the north side of the tree trunk within the bottom 12 inches of the trunk.

H. Balled and Burlapped (B&B) Plant Materials
   1. Trees designated B&B shall be properly dug with firm, natural balls of soil retaining as many fibrous roots as possible, in sizes and shapes as specified in the American Standard for Nursery Stock. Balls shall be firmly wrapped with nonsynthetic, rottable burlap and secured with nails and heavy, nonsynthetic, rottable twine. The root collar shall be apparent at surface of ball. Trees with loose, broken, processed, or manufactured root balls will not be accepted, except with special written approval before planting.
   NOTE: Some nurseries practice result in the root flare being buried several inches deep. The top of the root ball may be at ground level, but the root flare actually is too deep. Remove the excess soil on the top of the root ball. Proper planting depth requires the root flare to be at or slightly above the finished grade.

I. Container Plants
   1. Plants grown in containers shall be of appropriate size for the container as specified in the most recent edition of the American Standard for Nursery Stock and be free of circling roots on the exterior and interior of the root ball.
   2. Container plants shall have been grown in the container long enough to have established roots throughout the growing medium.

J. Bareroot and Collected Plants
   1. Plants designated as bareroot or collected plants shall conform to the American Standard for Nursery Stock.
   2. Bareroot material shall not be dug or installed after bud break or before dormancy.

K. Immediately after harvesting plants, protect from drying and damage until shipped and delivered to the planting site. Rootballs shall be checked regularly and watered sufficiently to maintain root viability.

L. Transportation and Storage of Plant Material
   1. Branches shall be tied with rope or twine only, and in such a manner that no damage will occur to the bark or branches.
2. During transportation of plant material, the contractor shall exercise care to prevent injury and drying out of the trees. Should the roots be dried out, large branches broken, balls of earth broken or loosened, or areas of bark torn, the landscape architect may reject the injured tree(s) and order them replaced at no additional cost to the owner. All loads of plants shall be covered at all times with tarpaulin or canvas. Loads that are not protected will be rejected.

3. All bareroot stock sent from the storage facility shall be adequately covered with wet soil, sawdust, woodchips, moss, peat, straw, hay, or other acceptable moisture-holding medium, and shall be covered with a tarpaulin or canvas. Loads that are not protected in the above manner may be rejected.

4. Plants must be protected at all times from sun or drying winds. Those that cannot be planted immediately on delivery shall be kept in the shade, well protected with soil, wet mulch, or other acceptable material, and kept well watered. Plants shall not remain unplanted any longer than three days after delivery. Plants shall not be bound with wire or rope at any time so as to damage the bark or break branches. Plants shall be lifted and handled with suitable support of the soil ball to avoid damaging it.

M. Mechanized Tree Spade Requirements

Trees may be moved and planted with an approved mechanical tree spade. The tree spade shall move trees limited to the maximum size allowed for a similar B&B root-ball diameter according to the American Standard for Nursery Stock or the manufacturer’s maximum size recommendation for the tree spade being used, whichever is smaller. The machine shall be approved by the landscape architect prior to use. Trees shall be planted at the designated locations in the manner shown in the plans and in accordance with applicable sections of the specifications.

2.2 ACCESSORIES

A. Planting Soil Mix:

1. Topsoil: As specified in Section 31 22 00.

2. Pine Bark: Commercial horticultural preparation, finely ground, free of extraneous and harmful matter.

B. Soil Conditioning Materials:

1. Aluminum Sulfate: Unadulterated, in manufacturer’s original, unopened container labeled with analysis and net weight. Use to acidify soil (lower pH) as recommended by soils test report.

2. Limestone: Raw, ground agricultural limestone, containing at least 90 percent calcium carbonate; 90 percent shall pass No. 10 sieve and 50 percent shall pass No. 50 sieve. Use to decrease acidity of soil (raise pH) as recommended by soils test report.

C. Fertilizer:

1. Superphosphate: Soluble mixture of treated minerals; 20% available phosphoric acid.

2. Commercial Fertilizers: Conforming to applicable Federal and State law, uniform as to composition, dry, free-flowing, and delivered to site in original unopened containers. Application rate and minimum analysis shall be as recommended by soils test report.

D. Mulch:
1. **Hardwood Mulch:** Material shall be mulching grade, uniform in size, and free of foreign matter. Submit sample for approval.

E. **Edging Materials:**

   NONE PERMITTED

F. **Miscellaneous Materials:**

   1. **Water:** Clean, free from toxic amounts of salt, oil, acid, alkali, organic matter or other substances harmful to plants.

**PART 3 - EXECUTION**

3.1 **EXAMINATION**

A. Examine proposed planting areas and conditions of installation. Do not start planting work until unsatisfactory conditions are corrected and fine grading has been approved by Landscape Architect.

B. **Subsurface Drainage Investigation:**

   1. **Required Tests:** Subsurface drains have not been included as part of project; therefore, Contractor shall make such reasonable percolation tests, approved by Landscape Architect, as may be necessary to determine if subsurface drainage conditions in landscape areas are so poor as to support moisture conditions potentially fatal to plantings. The following procedure is recommended:

   a. Wait at least twenty-four (24) hours after rain and dig test pit twelve (12) inches square or 13-1/2 inches in diameter to depth of bottom of plant bed, trench or pit. Remove all loose soil (if standing water is visible, notify the Landscape Architect).

   b. Quickly fill pit bottom with six (6) inches (approximately 3-1/4 gallons) of water.

   c. Record length of time from filling until disappearance of water and divide the number of minutes by six (6) to give average time of one (1) inch fall.

   d. Compare one (1) inch fall time with following table:

      - 1 inch in 0-3 min. indicates rapid absorption.
      - 1 inch in 3-5 min. indicates medium absorption.
      - 1 inch in 5-30 min. indicates slow absorption.
      - 1 inch in 30-60 min. indicates semi-impervious soil.
      - 1 inch in over 60 min. indicates impervious soil.

   e. If soil is indicated to be semi-impervious or impervious, or if water is initially found in test pit, notify Landscape Architect before proceeding further.

   f. If Contractor does not make test at representative locations and file records of results with Owner and Landscape Architect, or if he plants in areas shown to have poor drainage without written release from Owner, he shall be liable for any future guaranteed replacements due to subsurface water damage.

   g. If Contractor makes proper tests and files complete records indicating no semi-impervious or worse conditions, he will not be held responsible for future subsurface water damage to work of Contract within Guaranty Period. Owner or Landscape Architect may supervise testing at any time.
2. Relocation or Omission of Plants:
   a. Where subsurface conditions provide inadequate drainage and subsurface drainage system is not to be used as remedy, make reasonable relocation of plants as directed by Landscape Architect.
   b. Drainage conditions necessitating omission of plants shall be covered by Change Order.

3. Authorization of Drain as Extra Work: Owner may authorize installation of subsurface drains to alleviate moisture problems at locations determined by Landscape Architect. Perform work at negotiated extra cost; begin work only upon receipt of Change Order. Locations, appropriate materials, and construction techniques shall be as directed by Landscape Architect.

3.2 PREPARATION

A. Utility Verification: Contractor will be responsible for damages to any unmarked utility.

1. The contractor shall contact the local utility companies for verification of the location of all underground utility lines in the area of the work. The contractor shall be responsible for all damage resulting from neglect or failure to comply with this requirement.

B. Soil Conditioning:

1. Coordinate soil conditioning with soil testing and fine grading operations specified in Section 02200.

2. Adjustment of pH: If the pH range of the soil samples from the proposed planting sites is not acceptable, the Contractor shall, upon receipt of authorization to proceed by Change Order, adjust the pH of the existing soils within the unacceptable areas. Adjust pH by uniformly incorporating required soil conditioning materials at the rate determined by the analysis of the soil test done by the Soils Testing Laboratory.

C. Location of Plants: Place individual plants and stake plant beds as indicated on Drawings. Notify Landscape Architect for approval prior to planting. Contractor shall make reasonable adjustment of plant locations as recommended by Landscape Architect.

D. Obstructions:

1. Obstructions at or below grade shall be removed where possible; obstructions such as functioning utilities or objects too massive to be removed with tractor mounted backhoe will require plant relocations as directed by Landscape Architect.

2. Above Ground: Report overhead interference such as wires, overhangs, etc., to Landscape Architect and relocate plantings as directed.

3. Repairs: Contractor shall familiarize himself with the location of all underground and above-ground improvements and take care not to disturb improvements during his installation operations. Contractor shall repair or replace at Contractor's sole expense improvements damaged by his installation operations.

E. EXCAVATION FOR TREES AND SHRUBS
a. Locations for plants and/or outlines of areas to be planted are to be staked out at the site. Locate and mark all subsurface utility lines. Approval of the stakeout by the landscape architect is required before excavation begins.

b. Tree, shrub, and groundcover beds are to be excavated to the depth and widths indicated on the drawings. If the planting area under any tree is initially dug too deep, the soil added to bring it up to the correct level should be thoroughly tamped.

1. The sides of the excavation of all planting areas shall be sloped at 45 degrees. The bottom of all beds shall slope parallel to the proposed grades or toward any subsurface drain lines within the planting bed. The bottom of the planting bed directly under any tree shall be horizontal such that the tree sits plumb.

2. Maintain all required angles of repose of the adjacent materials as shown on the drawings. Do not excavate compacted subgrades of adjacent pavement or structures.

c. For trees and shrubs planted in individual holes in areas of good soil that is to remain in place and/or to receive amendment in the top 150-mm (6 in.) layer, excavate the hole to the depth of the root ball and to widths shown on the drawing. Slope the sides of the excavation at a 45 degree angle up and away from the bottom of the excavation.

1. In areas of slowly draining soils, the root ball may be set up to 75 mm (3 in.) or 1/8 of the depth of the root ball above the adjacent soil level.

2. Save the existing soil to be used as backfill around the tree.

3. On steep slopes, the depth of the excavation shall be measured at the center of the hole and the excavation dug as shown on the drawings.

D. Detrimental soil conditions: The landscape architect is to be notified, in writing, of soil conditions encountered, including poor drainage, which the contractor considers detrimental to the growth of plant material. When detrimental conditions are uncovered, planting shall be discontinued until instructions to resolve the conditions are received from the landscape architect.

E. Obstructions: If rock, underground construction work, utilities, tree roots, or other obstructions are encountered in the excavation of planting areas, alternate locations for any planting shall be determined by the landscape architect.

F. Planting Mixture:

1. **Mixture for shrubs, trees and groundcovers:** Clean friendly native top soil.
   
a. Add soil amendments necessary to adjust soil to required pH for plant material, as recommended in soil test report.

   b. Add 1/2 lb. superphosphate per cubic yard for planting mixture.

2. Place and compact mixture to 6-inch depth in bottom of pit. Reserve enough mixture for backfill.

3. **Groundcover Beds:** Till and pulverize soil to a depth of 6 inches below grade. Mix by tilling the material as described above.

3.3 INSTALLATION
A. Plants shall be set on flat-tamped or unexcavated pads at the same relationship to finished grade as they were to the ground from which they were dug, unless otherwise noted on the drawings. Plants must be set plumb and braced in position until topsoil or planting mix has been placed and tamped around the base of the root ball. Improper compacting of the soil around the root ball may result in the tree settling or leaning. Plants shall be set so that they will be at the same depth and so that the root ball does not shift or move laterally one year later.

NOTE: Proper planting depth requires the root flare to be at or slightly above the finished grade. It is important to determine how deep the root flare is in the ball before it is placed in the planting hole. Sometimes the top of the ball may need to be raised until the root flare is at the proper planting depth and/or soil must be removed from the top of the ball.

1. Determine the elevation of the root flare and ensure that it is planted at grade. This may require that the tree be set higher than the grade in the nursery.

2. If the root flare is less than 50 mm (2 in.) below the soil level of the root ball, plant at the tree the appropriate level above the grade to set the flare even with the grade. If the flare is more than 50 mm (2 in) at the center of the root ball the tree shall be rejected.

B. Lift plants only from the bottom of the root balls or with belts or lifting harnesses of sufficient width not to damage the root balls. Do not lift trees by their trunk or use the trunk as a lever in positioning or moving the tree in the planting area.

C. Remove plastic, paper, or fiber pots from containerized plant material. Pull roots out of the root mat, and cut circling roots with a sharp knife. Loosen the potting medium and shake away from the root mat. Immediately after removing the container, install the plant such that the roots do not dry out. Pack planting mix around the exposed roots while planting.

D. The roots of bare-root trees shall be pruned at the time of planting to remove damaged or undesirable roots (those likely to become a detriment to future growth of the root system). Bare-root trees shall have the roots spread to approximate the natural position of the roots and shall be centered in the planting pit. The planting-soil backfill shall be worked firmly into and around the roots, with care taken to fill in completely with no air pockets.

E. Cut ropes or strings from the top of shrub root balls and trees smaller than 3 in. caliper after plant has been set. Remove burlap or cloth wrapping and any wire baskets from around top half of balls. Do not turn under and bury portions of burlap at top of ball.

1. Do not immediately remove the ropes and burlap from trees larger than 3 in. caliper. Return to each tree three months after planting (six months for full-planted material), and cut all ropes around the trunks and tops of the root balls of these trees.

2. Completely remove any waterproof or water-repellent strings or wrappings from the root ball and trunk before backfilling.

F. Set balled and burlapped trees in the hole with the north marker facing north unless otherwise approved by the landscape architect.

G. Place native soil, topsoil, or planting mix into the area around the tree, tamping lightly to reduce settlement.

1. For plants planted in individual holes in existing soil, add any required soil amendments to the soils, as the material is being backfilled around the plant. Ensure that the amendments are thoroughly mixed into the backfill.

2. For plants planted in large beds of prepared soil, add soil amendments during the soil installation process.
3. Ensure that the backfill immediately around the base of the root ball is tamped with foot pressure sufficient to prevent the root ball from shifting or leaning.

H. Thoroughly water all plants immediately after planting. Apply water by hose directly to the root ball and the adjacent soil.

I. Remove all tags, labels, strings, etc. from all plants.

J. Remove any excess soil, debris, and planting material from the job site at the end of each workday.

K. Form watering saucers 100 mm (4 in.) high immediately outside the area of the root ball of each tree as indicated on the drawings.

M. Pruning

1. Plants shall not be heavily pruned at the time of planting. Pruning is required at planting time to correct defects in the tree structure, including removal of injured branches, double leaders, waterspouts, suckers, and interfering branches. Healthy lower branches and interior small twigs should not be removed except as necessary to clear walks and roads. In no case should more than one-quarter of the branching structure be removed. Retain the normal or natural shape of the plant.

2. All pruning shall be completed using clean, sharp tools. All cuts shall be clean and smooth, with the bark intact with no rough edges or tears. All pruning cuts shall be made just outside of the collar at the base of the branch.

3. Except in circumstances dictated by the needs of specific pruning practices, tree paint shall not be used. The use of tree paint shall be only upon approval of the landscape architect. Tree paint, when required, shall be paint specifically formulated and manufacturing for horticultural use.

4. Pruning of large trees shall be done from a hydraulic man-lift such that it is not necessary to climb the tree.

N. Tree Guying, and Staking

1. Staking and guying shall not be required unless conditions exist (such as high wind exposure, loose soil conditions, small/rounded root balls, etc.) that warrant stabilizing the plant materials. This decision shall be made by the contractor and approved by the owner’s representative. Staking may weaken the initial tree development. If required or recommended, staking shall be completed immediately after planting. Trees up to two inches (5 cm) caliper are to be staked with two wood stakes and separate flexible Arbor Ties. For larger trees use three strands of guying material and ground anchors. Ground anchors are to be driven at approximately a 45° angle to ground plane in line with guying material and distributed at 120° intervals around the trunk. Anchors shall be driven to 2 – 3” above finish grade. Tie guying material to anchor and cap anchor with safety cap.

2. Stakes and guys shall be installed immediately upon approval or planting, and shall be removed at the end of the first growing season. Any trees that is not stable at the end of this time shall be rejected.

3. Leave enough slack in the guy cords to allow the tree to sway. The cords shall be tied loosely above a branch or crotch.

O. Fertilizing

1. Time of Application: Apply at time of planting or promptly thereafter. Do not apply during period of August 16th through March 15th.
2. Methods of Application: Uniformly spread on soil surface prior to mulching at specified rate.

3. Rates of Application: Apply fertilizer at rate and ratio according to recommendations from soil tests. Fertilizer rates listed below are general rates, which may be altered due to specific soil requirements:

- Trees: 16-4-8 at 2 pounds per inch of caliper.
- Shrubs: 5-10-10 at 20 pounds per 100 square feet.
- Groundcovers: 5-10-10 at 2 pounds per 100 square feet.
- Vines: 5-10-10 at 2 pounds per 100 square feet.
- Herbaceous Plants: 5-10-10 at 2 pounds per 100 square feet.

P. Mulch

1. Areas to receive mulch: all plant beds and other areas as designated on Drawings shall be mulched.

2. Placement: Place mulch to required uniform depth soon after planting to prevent drying of planting soil around roots. When other operations such as fertilizing do not necessitate delay, mulch promptly after planting; do not delay more than 3 days after plants have been set.

   a. Apply Hardwood Mulch at a uniform depth of 3 inches, except in groundcover beds where it shall be a uniform depth of 2 inches. Work mulch neatly down among plants to give good appearance.

3.4 MAINTENANCE

A. Maintenance shall begin immediately after each plant is planted and continue until its acceptance has been confirmed by the landscape architect.

B. Maintenance shall consist of pruning, watering, cultivating, weeding, mulching, tightening and repairing guys and stakes, resetting plants to proper grades or upright position, restoring of the planting saucer, and furnishing and applying such sprays or other materials as necessary to keep plantings free of insects and diseases and in vigorous condition.

C. Planting areas and plants shall be protected at all times against trespassing and damage of all kinds for the duration of the maintenance period. If a plant becomes damaged or injured, it shall be treated or replaced as directed by the landscape architect at no additional cost.

D. Watering: Contractor shall irrigate as required to maintain vigorous and healthy tree growth. Overwatering or flooding shall not be allowed. The contractor shall monitor, adjust, and use existing irrigation facilities, if available, and furnish any additional material, equipment, or water to ensure adequate irrigation. Root balls of all trees and large shrubs shall be spot watered using handheld hoses during the first four months after planting, as required to ensure adequate water within the root ball.

E. During periods of restricted water usage, all governmental regulations (permanent and temporary) shall be followed. The contractor may have to transport water from ponds or other sources, at no additional expense to the owner when irrigation systems are unavailable.

3.5 ACCEPTANCE
A. Standard for Acceptance of Plantings: Each plant shall be as specified, properly installed and maintained in good healthy condition. All water saucers and beds shall be neatly formed and mulched. Beds shall be free of weeds and erosion damage.

B. Work may be accepted in parts when the landscape architect and contractor deem that practice to be in their mutual interest. Approval must be given in writing by the landscape architect to the contractor verifying that the work is to be completed in parts. Acceptance of work in parts shall not waive any other provision of this contract.

C. Upon acceptance, the Owner will assume plant maintenance.

3.6 CLEANING

A. Remove from site all excess materials, soil, debris, and equipment. Repair damage resulting from planting operations.

3.7 GUARANTEE PERIOD AND REPLACEMENT

A. The guarantee period for trees and shrubs shall begin at the date of acceptance.

B. The contractor shall guarantee all plant material to be in healthy and flourishing condition for a period of one year from the date of acceptance.

C. When work is accepted in parts, the guarantee periods extend from each of the partial acceptances to the terminal date of the guarantee of the last acceptance. Thus, all guarantee periods terminate at one time.

D. The contractor shall replace, without cost, as soon as weather conditions permit, and within a specified planting period, all plants determined by the landscape architect to be dead or in an unacceptable condition during and at the end of the guarantee period. To be considered acceptable, plants shall be free of dead or dying branches and branch tips and shall bear foliage of normal density, size, and color. Replacements shall closely match adjacent specimens of the same species. Replacements shall be subject to all requirements stated in this specification.

E. The guarantee of all replacement plants shall extend for an additional period of one year from the date of their acceptance after replacement. In the event that a replacement plant is not acceptable during or at the end of said extended guarantee period, the landscape architect may elect subsequent replacement or credit for that item.

F. At the end of the guarantee, the contractor shall reset grades that have settled below the proposed grades on the drawings.

G. The contractor shall make periodic inspections, at no extra cost, during the guarantee period to determine what changes, if any, should be made in the maintenance program. If changes are recommended, they shall be submitted in writing to the landscape architect. Claims by the contractor that the owner’s maintenance practices or lack of maintenance resulted in dead or dying plants will not be considered if such claims have not been documented by the contractor during the guarantee period.

3.8 FINAL ACCEPTANCE
A. At the end of the guarantee period and upon written request of the contractor, the landscape architect will inspect all guaranteed work for final acceptance. The request shall be received at least ten calendar days before the anticipated date for final inspection. Upon completion and re-inspection of all repairs or renewals necessary in the judgment of the landscape architect at that time, the landscape architect shall certify, in writing, that the project has received final acceptance.
SECTION 34 41 16
TRAFFIC CONTROL EQUIPMENT
ACCEPTABLE WORK ZONE TRAFFIC CONTROL DEVICES
NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM REPORT 350 REQUIREMENTS
SCDOT SUPPLEMENTAL SPECIFICATIONS

A. GENERAL:
   This specification provides the requirements for implementation of the National Cooperative Highway Research Program Report 350 criteria for all work zone traffic control devices used and placed into operation on or adjacent to the roadways within work zones in the state of South Carolina.

B. PERFORMANCE:
   All work zone traffic control devices shall maintain performance levels as required by the Standard Specifications, the special provisions, all supplemental specifications, the manufacturer’s requirements and specifications, and the SCMUTCD. A reduction of the performance levels of these traffic control devices in order to meet the requirements of the NCHRP Report 350 is unacceptable. Any reduction of the required performance levels will disqualify a device for use on or adjacent to the roadways within work zones in the state of South Carolina.

C. REQUIREMENTS:
   All work zone traffic control devices acceptable for use in South Carolina are compiled on a list entitled, "Approved Work Zone Traffic Control Devices". This list is available from the Director of Traffic Engineering upon request. Only those devices contained on this list may be used.
   To be eligible for inclusion on the approved list, the manufacturer shall submit a self certification of NCHRP Report 350 compliance for Category I devices to the Director of Traffic Engineering. Category II, III, and IV devices require acceptance letters, issued by the Office of Engineering of the Federal Highway Administration, for inclusion on the approved list.
   The Department reserves the right, as granted by the FHWA, to reject the design of a traffic control device or place limitations on its use. Manufacturer’s certification or FHWA acceptance does not constitute or imply that the device is acceptable for use in South Carolina. The Department may reject or restrict the use of any traffic control device based on the following:
   1. A differing interpretation of the test results.
   2. Insufficient test results, may require additional testing.
   3. Insufficient field data, may require in-service evaluation.

   The Contractor shall provide, install, and use only those work zone traffic control devices included on the approved list in effect at time of the contract award. However, the Department retains the right to delete devices from or add devices to this list without providing prior notice to the Contractor.
   All work zone traffic control devices are categorized according to their functions and weight. There are four categories. The NCHRP Report 350 requires specific tests for each category. The traffic control devices within each category shall pass the designated test requirements to achieve approval for use.
   Category I contains small and lightweight channelizing and delineating traffic control devices which includes plastic cones, portable plastic drums, and tubular markers without attachments such as signs or warning lights. Warning lights will no longer be attached to portable plastic drums. The typical traffic control standard drawings will reflect this update as of the next issuance of revised drawings in late 1999. Therefore, the requirement for warning lights supplementing the portable plastic drums as shown on the current typical traffic control standard drawings will be nullified.
   Category II includes traffic control devices that are not expected to produce significant vehicular velocity changes to impacting vehicles. Acceptable devices in this category shall not be capable of penetrating a windshield or causing vehicular instability during a crash. Portable sign stands mounted with signs, Types I, II,
TRAFFIC CONTROL EQUIPMENT

D. FIELD INSTALLATIONS:

The Contractor shall install all work zone traffic control devices as required by the plans, the “Standard Drawings For Road Construction”, the special provisions, all supplemental specifications, the manufacturer’s requirements and specifications, the SCMutCD, and the Engineer. Revision to the field installation requirements in order to circumvent the requirements of the NCHRP Report 350 is unacceptable. Any such revisions to the field installations will disqualify a device for use on or adjacent to the roadways within work zones in the state of South Carolina.

E. RESPONSIBILITY:

The Contractor shall ensure all traffic control devices meet the requirements of these departmental specifications. The Contractor is responsible for complying with all requirements as directed by these specifications.

END OF SECTION 34 41 16