# REQUEST FOR PROPSALS

# NORTHVILLE DOWNS RIVER PROJECT

**BID DUE**: Thursday, 3:00 PM
May 9, 2024

**ISSUE DATE**: April 22, 2024

**CITY OF NORTHVILLE**
**215 W. MAIN STREET, NORTHVILLE, MICHIGAN 48167**

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## REQUEST FOR PROPOSALS

## NORTHVILLE DOWNS RIVER PROJECT

CITY OF NORTHVILLE
215 W. MAIN STREET
NORTHVILLE, MICHIGAN 48167

The City of Northville is calling for proposals to daylight a section of the Rouge River as part of The Downs development, 301 South Center Street, Northville, MI, 48167. Sealed proposals will be received at Northville City Hall, 215 W. Main Street, Northville, MI 48167 up until **3:00 p.m. local time, Thursday, May 9, 2024** for the furnishing of all labor, equipment and materials necessary to daylight approximately 800 LF of the Rouge River. At that time the bids received will be publicly opened and read aloud.

The project includes demolition of the existing enclosed channel, earthwork, bridge and bridge abutment construction, site restoration and related items of work.

Bidding Documents must be downloaded from BidNet: part of the Michigan Inter-governmental Trade Network (MITN) purchasing Group. Registration to MITN is available through their toll free support department at 1-800-835-4603 option #2 and the following website: https://www.bidnetdirect.com/mitn .

The date that the Bidding Documents are downloaded from BidNet will be considered the Bidder's date of receipt of the Bidding Documents. Neither Owner nor Engineer will be responsible for full or partial sets of Bidding Documents, including Addenda if any, obtained from sources other than BidNet.

Proposals may either be mailed or hand delivered to the Director of Strategic Planning and Special Projects at 215 W. Main Street, Northville, MI 48167 and are to be clearly marked: **Bid Documents: Northville Downs River Project**.

Questions regarding this Proposal can be directed to the Owner's Representative on the Project Andrew Milia, Franklin Property Corporation, 248-539-3332, amilia@franklinpropertycorp.com, or Wendy Wilmers Longpre, City of Northville, 248-305-2710, wlongpre@ci.northville.mi.us.

Proposals must be accompanied by a certified check, cashier's check or bid bond payable to the City of Northville, in the amount of not less than five percent (5%) of the bid amount, which shall be forfeited to the City of Northville if the bidder to whom the Contract is awarded fails to enter into a Contract within ten (10) days after the Contract is awarded. The unsuccessful bidders' checks or bid bonds will be returned upon final award of Contract, approved and executed.

The City of Northville reserves the right to accept any bid, reject any or all bids, to waive informalities and make the award in any manner deemed in the best interest of the City of Northville.

CITY OF NORTHVILLE

By: Michael Smith
City Clerk

## INSTRUCTIONS TO BIDDERS

## 1. GENDER EQUITY

These Contract Documents are non-gender specific. The use of his or her anywhere within these documents shall be completely interchangeable and shall mean the same. The use of his or her shall have no bearing regarding the sex of the bidders, contractors, subcontractors, suppliers, or other persons associated with this contract.

## 2. EXAMINATION OF CONTRACT DOCUMENTS AND SITE

Before submitting their Bid, each Bidder must (a) examine the Contract Documents thoroughly; (b) familiarize themselves with federal, state, and local laws, ordinances, rules and regulations affecting performance of the work; and (c) carefully correlate their observations with the requirements of the Contract Documents.

The bidder shall be responsible for investigating and evaluating subsurface or latent physical conditions along the site of the work. Where information concerning existing conditions, including subsurface conditions, is provided or mentioned in the Contract Documents, such information is provided for the convenience of the bidder and to provide the bidder information known by the City of Northville. However, the City does not represent or guarantee any specific site conditions, including subsurface conditions. The Bidder shall be solely responsible for all necessary site investigations to insure the proposal is based on conditions which exist in and adjacent to the project site.

All questions about the meaning or intent of any ambiguity, discrepancy, omission or error in the Contract Documents shall be submitted to the Owners Representative. Replies will be issued by Addenda to all parties recorded by the Owners Representative as having received the Bidding Documents. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

The submission of a Bid will constitute an incontrovertible representation by the Bidder that they have complied with and understand every requirement of these instructions. Failure or omission of the Bidder to do all of the foregoing shall in no way relieve the Bidder from any obligations in respect to his Bid.

## 3. PRECEDENCE OF CONTRACT DOCUMENTS

In the event that any variance should arise between the Standard Specifications, Special Conditions, or the Construction Drawings the order of precedence will be:

| | |
|---|---|
| First Authority | - Special Conditions |
| Second Authority | - Construction Drawings |
| Third Authority | - Standard Specifications |

## 4. PREPARATION OF BID

The required bidding forms, labeled **PROPOSAL AND CONTRACT,** are included in the Project Manual and Specifications as part of the Contract Documents. All bids must be made on the required forms prepared and executed fully and properly, including the Declaration of Contractor clause. A price must be given for each item in that portion of the Project being bid. The proposed prices and amounts are for furnishing all labor, materials, equipment, tools, and services required to complete the work in accordance with the Contract Documents. Proposals shall be made in duplicate on the Proposal and Contract forms provided. When applicable, each Bidder shall acknowledge receipt of all Addenda issued for the Proposal by signing the Proposal form where indicated. Failure of a Bidder to acknowledge receipt of any and all Addenda may result in the rejection of the Bid.

## 5. SIGNATURES:

All bids, notifications, claims and statements must be signed as follows:

a. Corporations: Signature of official shall be accompanied by a certified copy of the Resolution of the Board of Directors authorizing the official signing to bind the corporation.

b. Partnerships: Signature of one partner shall be accompanied by a certified copy of the Power of Attorney authorizing the individual signing to bind all partners. If bid is signed by all partners, no authorization for signature is required.

c. Individual: No authorization for signature is needed.

All names must be typed or printed below the signature. Each signature must be witnessed.

## 6. BID GUARANTEE

Each proposal shall be accompanied by a certified check, cashier's check or bid bond on an open, solvent Michigan bank in the amount of five percent (5%) of the base bid, payable to the City of Northville as a guarantee of good faith. If the successful bidder fails to furnish satisfactory bonds and insurance within ten (10) days after notice of award, such guarantee shall be forfeited to the City as liquidated damages. The guarantees of the three lowest bidders will be retained until the bonds and insurance of the Contractor have been approved by the City. The bid guarantees of all other bidders will be returned within ten days after the bid opening.

## 7. SUBMISSION

Submit proposals in a sealed envelope labeled "Sealed Proposal" and marked with the project name and bidder identification. Proposals must be received by the Issuing Office, not later than the time specified, at which time and place the proposals will be publicly opened and read aloud. The Proposal may either be mailed or hand delivered to the Issuing Office located at the address identified in the Advertisement for Bid. It is the sole responsibility of the Bidder to see that their proposal is received in proper time. Any proposal received after the scheduled closing time for receipt of proposals shall be returned to the Bidder unopened.

## 8. BID OPENING

Bids will be opened in public and read aloud at the place and time set for the opening in the Advertisement for Bid. Late bids will not be considered. The contents of accepted bids will be released to all Bidders and others having a legitimate interest as determined by the City. No Bidder may withdraw a bid after the opening for a minimum period of sixty (60) days without forfeiting its Bid Guarantee.

## 9. COMPETENCY OF BIDDERS

Upon the request of the City, Bidders shall be prepared to furnish sufficient evidence as to their qualifications to perform the project work, such as record of past performances including references, equipment and personnel available, and such other pertinent and material facts as may be desirable. Furthermore, upon the request of the City, the Bidder shall submit financial statements.

In addition the successful Bidder will be required to obtain bonding and insurance with sureties acceptable to the City. Said bonds shall be Performance Bond and Labor and Material Bond, both in the amount of 100 percent (100%) of the Contract bid amount and a Maintenance and Guarantee in the amount of 50 percent (50%) of the Contract bid amount. Said insurances shall include workers compensation and employer liability, automobile liability, contractor’s public liability and owner’s protective liability which shall indemnify the City of Northville for actions of the Contractor. The bonding and insurance requirements are discussed further in the General Conditions of this Proposal package.

## 10. REJECTION OF BIDS

The City reserves the right to reject any or all bids and to waive any defects in bids. The reason(s) for the disqualification of a bidder and the rejection of its proposal may include, but are not limited to, the following:

a. More than one proposal for the same work from an individual, firm, partnership, or corporation under the same or different names.

b. Evidence of collusion among bidders.

c. Unbalanced proposals in which the prices for some items are substantially out of proportion to the price of other items.

d. Failure to submit a unit price or lump sum for each item of work listed in the proposal.

e. Lack of competency as revealed by financial statement or experience record.

f. Unsatisfactory performance record as shown by past work judged from the standpoint of workmanship and progress.

g. Uncompleted work which, in the judgment of the City, might hinder or prevent the prompt completion of additional work.

h. Involvement in any way in which there could be a conflict of interest such as kick backs and gratuities.

i. If the proposal is on a form other than that furnished herein, or if the form is altered or any part thereof is detached.

j. If there are unauthorized additions, conditional or alternate bids, or irregularities of any kind which may tend to make the proposal incomplete, indefinite, or ambiguous as to its meaning.

k. If the Bidder adds any provisions reserving the right to accept or reject an award, or to enter into a Contract pursuant to an award.

## 11. CONTRACT

It is agreed that this Proposal shall be a continuing offer on the part of the Contractor until it is accepted or rejected by the City, provided, however, that the Contractor executes and delivers this Proposal on condition that it may not be withdrawn within a period of sixty (60) days from the date the Proposals are publicly opened, as herein specified, or from any adjourned date for the opening thereof. It is further agreed that this Proposal may be accepted by the City by the execution hereof by its proper officers and thereafter this Proposal shall be a completed Contract between the parties.

## 12. NOTIFICATION OF AWARD AND CONTRACT EXECUTION

Upon acceptance by the City, the successful bidder will be notified of award in writing and shall within ten (10) days thereafter furnish the required insurance and bonds. The City within ten (10) days of receipt of acceptable bonds and insurance certificates, shall sign the Proposal and return to the successful bidder a signed duplicate which shall constitute the Contract between the City and the Contractor.

# PROPOSAL AND CONTRACT

## 1. OWNER AND PROJECT INFORMATION

Owner: City of Northville
215 W. Main Street
Northville, MI 48167

Owners Representative: Franklin Property Corporation
31500 Northwestern Hwy, Suite 105
Farmington Hills, MI 48334

Project Name: Northville Downs River Project
301 S. Center Street
Northville, MI 48167

Bid Opening Date: 3:00 PM, Thursday, May 9, 2024

## 2. BIDDER INFORMATION

The undersigned bidder proposes and agrees to furnish all labor, materials, equipment, tools and services required to complete the work in accordance with the specifications and conditions contained herein in consideration of the sum or sums stated below and agree that this document will constitute the Contract if accepted by the City.

Bidder _____

Complete Address _____

_____

Authorized Signature _____ Date _____

Printed Name _____

Title _____

Witness's Signature _____ Date _____

## 3. BASIS OF BID

We the undersigned, propose to furnish all labor, materials, equipment, tools and services for the completion of the General Construction Contract, for the above-named project in accordance with Drawings, Specifications and all Addenda for the sum detailed below and hereby agree to enter into a Contract for the work if this proposal is accepted.

## PROPOSAL: Northville Downs River Project

Per construction plans provided by Barr dated 4/15/24, GMA dated 4/19/24 and G2 Consulting Group dated 4/19/24.

| | | QTY | UNITS | COST | TOTAL |
|---|---|---|---|---|---|
| | **SCOPE 1 - Earthwork Portion** | | | | |
| 1 | Mobilize required equipment to the site to perform the requested work. | 1 | LS | | |
| 2 | Furnish and install one mud mat for the proposed project. | 1 | EA | | |
| 3 | Removal and haul onsite the existing surface gravel within the river relocation work limits. | 1 | LS | | |
| 4 | Perform the site cut for the proposed river improvements and stockpile cut material onsite in a stockpile within Northville Downs limits for others use. | 1 | LS | | |
| 5 | Supply and install two areas of sheet piling approx. 20' x 40' each. | 2 | EA | | |
| 6 | Provide surface water pumping for scope of work. | 1 | LS | | |
| 7 | Crush approx. 90 % of existing river culvert and leave in place. | 1 | LS | | |
| 8 | Crush remaining culvert, load into trucks and haul to a location where it will be buried within the original culvert location. | 1 | LS | | |
| 9 | Supply and install steel casing under riverbed for future sanitary sewer installation | 1 | LS | | |
| 10 | Fill over the crushed culvert and compact with excavated material from the site. | 1 | LS | | |
| 11 | Perform the required grading to establish proposed sub grades within +/- 0.30'. | 1 | LS | | |
| 12 | Import and install up to 3,000 TY of CLEAN topsoil. (Quote on a unit basis in truck cubic yards) | 3,000 | SY | | |
| 13 | Dust Control (Quote on a daily basis and provide budget) | 1 | DAY | | |
| 14 | Estimated number of days | | | | |
| 15 | Silt fence installation and maintenance during term of project. | 1 | LS | | |
| 16 | 6' chain link fence around perimeter of project with wind screen. | 1 | LS | | |
| | **Subotal SCOPE 1 Earthwork Portion** | | | | |
| | **Potential Additions:** | | | | |
| A | Add to load and haul approx. 39,000 TY (clean) cut material offsite. (Quote on a unit basis in truck cubic yards.) | 39,000 | TY | | |
| B | Add to load, haul, and dispose in landfill approx. 69,525 Tons. (Quote on a unit basis in tons) | 69,525 | TON | | |

| | | | | | |
|---|---|---|---|---|---|
| | **SCOPE 2 - Restoration Portion** | | | | |
| 17 | Placement and Fine Grading Topsoil | 1,876 | CY | | |
| 18 | Turf Reinforcement Mat | 322 | SY | | |
| 19 | Toe Wood | 855 | LF | | |
| 20 | Furnish and Install Boulder Clusters | 4 | EA | | |
| 21 | Furnish and Install Boulder Vane | 6 | EA | | |
| 22 | Furnish and Install Natural Cobblestone Riffle | 1,097 | SY | | |
| 23 | Furnish and Install Live Stakes | 2,565 | EA | | |
| 24 | Furnish and Install Shrubs (1 Gallon) | 84 | EA | | |
| 25 | Furnish and Install Shrubs (Bare Root) | 252 | EA | | |
| 26 | Seeding, Midwest Mesic Pollinator Seed Mix | 0.90 | ACRE | | |
| 27 | Seeding, Wet to Mesic Prairie Seed Mix | 1.50 | ACRE | | |
| 28 | Furnish and Install Erosion Control Blanket (NA GREEN C125BN) | 4,120 | SY | | |
| 29 | Furnish and Install Erosion Control Blanket (NA GREEN SC150BN) | 7,138 | SY | | |
| | **Subtotal SCOPE 2 - Restoration Portion** | | | | |
| | **SCOPE 3 - Pedestrian Bridge Construction and Common Area Landscaping** | | | | |
| 30 | Bridge construction and landscaping per GMA plans dated 3/11/24 | 1 | LS | | |
| 31 | Related structures per G2 plans in attached Dropbox | 1 | LS | | |
| | For Scope 3 provide as much detail and unit cost pricing as possible for accurate review and vetting purposes. Attach additional sheets as needed. | | | | |
| | **Subtotal SCOPE 3 - Pedestrian Bridge Construction Portion** | | | | |
| | **TOTAL BID** | | | | |

**Note:** LS = Lump Sum, LF = lineal feet, SY = square yards, CY = cubic yards

| | **SCHEDULE AND EQUIPMENT** |
|---|---|
| 1 | Please provide a schedule of completion from start to finish. |
| 2 | Please provide an equipment schedule. |
| 3 | Please indicate if crews will be working on Saturdays. |
| 4 | Please provide a list of comparable size jobs completed by your company in the past 5 years. |
| 5 | Any subcontracted services proposed by the bidder shall be described and information provided about services the subcontractor will provide as it relates to this proposal. Include the name of the subcontractor, prior business relationships with these firms, the experience and qualifications of said entities, and thje methods the contractor will employ to manage the subcontractor. The financial and legal relationship between the bidder and the subcontractor must be described in the proposal and approved by the City prior to initiation of a contract. |
| 6 | Bidders and their subcontractors must comply with all confidentiality laws and will be responsible for standard insurance requirements, which are part of these specifications. |

## 4. TIME OF COMPLETION

Bidder agrees that the work will be substantially complete in _____ calendar days.

## 5. RECEIPT OF ADDENDA

Bidder acknowledges receipt of the following addenda to the drawings and specifications:

| Addendum Number | Date |
|---|---|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

## 6. SUBCONTRACTOR AND SUPPLIER LIST

| Work Item | Company |
|---|---|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

## 7. DECLARATION OF CONTRACTOR

The undersigned, as Bidder, hereby declares this bid is made in good faith, without fraud or collusion with any person bidding, and that the plans, specifications, other information referenced in the **INSTRUCTION TO BIDDERS** has been examined. The Bidder confirms that they are familiar with the location of the work described and are fully informed as to the nature of the work and the conditions relating to its performance.

The Bidder acknowledges that all information provided by the City regarding the site conditions have been provided as a matter of convenience to all bidders, and understands that the City makes no warranties or representations of any nature whatsoever regarding such conditions, including subsurface conditions. The Bidder acknowledges that they have not relied upon any representations from the

City, its agents or employees, as to any conditions to be encountered in accomplishing the work, including subsurface conditions, and that the Bid is based solely upon the Bidder's own independent judgment.

The Bidder certifies that the Plans and Specifications have been examined, and that they have reviewed the proposed construction methods and finds them compatible with the site conditions which they anticipate based upon their investigation of this project.

The Bidder shall complete the work under any job or field condition which is present or is encountered and shall complete the work under whatever conditions exist, whether or not those site conditions were anticipated.

Signed,

_____
BIDDER

## 8. STARTING DATE

Unless otherwise stated herein or unless otherwise agreed upon by the Contractor and City, the Contractor shall commence work within ten (10) day of receiving notification that the project Contract has been signed by the City.

The starting date for this project shall be within 10 days of notification, but not before June 3, 2024, unless otherwise approved by the Owner's Representative.

## 9. COMPLETION DATE

The completion date for this project shall be October 31, 2024

## 10. BIDDER CONTACT INFORMATION

Name: _____
(Type or Print)

Title: _____
(Type or Print)

Phone: _____ Email _____

Address: _____

_____

## 11. ACCEPTANCE

This Proposal is accepted by the City of Northville and shall constitute the Contract for the work.

Approved as to form: _____ _____
City Attorney Date

City Council Approval: _____
Date

City Manager Approval: _____ _____
George Lahanas Date

## GENERAL CONDITIONS

## 1. DEFINITIONS

Wherever used in the Bidding or Contract Documents, the terms below, including the term's singular and plural forms, will have the meaning indicated in the definitions below.

*City* - City of Northville, Northville, Michigan.
*Manager* - City Manager of Northville or their authorized representative.
*Engineer* - City Engineer of Northville or their authorized representative.
*Contractor* - The Bidder whose proposal is accepted by the City.
*Notification* - Written notice delivered in person or by mail.
*Contract Documents* - Contract Documents shall include the Proposal and Contract form, the Project Manual and Specifications, all Addenda and Change Orders, and all Plans and Drawings.

## 2. CONTRACT DOCUMENTS

The work under this Contract shall consist of the items listed in the Proposal, including all incidental items necessary to fully complete the project in accordance with the Contract Documents. The Contract Documents shall consist of the Advertisement for Bids, Instruction to Bidders, Proposal, General Conditions, Technical Specifications, Special Conditions, Bonds, Contract and Construction Drawings, and all attachments, addenda and exhibits to the foregoing, and all easements, permits and other documents with which the Contractor must comply in performing the work hereunder. The intent of the Contract Documents is to include in the contract price the cost of all labor and materials, water, fuel, tools, plant, equipment, light, transportation, and all other expenses as may be necessary for the proper execution and completion of the work.

The original specifications, supplementary specifications and drawings constitute the documents according to which the work is to be done. The Contractor shall keep at the site of the work an approved copy of all specifications and drawings and shall at all times give the Engineer and their agents' access thereto. If in any case there shall be a question or dispute as to the meaning of the specifications or the drawings, the Engineer shall decide the true intent of the Documents.

## 3. ERRORS, CONFLICTS AND OMISSIONS

The intent of the Contract Documents is to provide everything necessary for the proper execution of the work. However, no work shall be done under conditions which may be expected to result in defective work. If the Contractor wishes to question the materials prescribed or the site conditions, it shall immediately notify the Engineer. The Engineer shall review these conditions, and if deemed necessary, shall direct changes to be made in design or construction procedures before work is continued. The Contractor shall not be allowed to take advantage of any error, conflict or omission, as full instructions will be issued by the Engineer,

and the Contractor shall carry out such instructions as if originally specified. In case of conflict, the work shall not proceed until a decision has been agreed upon by all parties concerned. Any work done by the Contractor after discovery of an error, omission or conflict until authorized, will be at the Contractor's risk and responsibility and without additional compensation to the Contractor.

## 4. CONTRACTOR'S RESPONSIBILITIES

The Contractor shall assume full responsibility for the work and take all precautions for preventing injuries to persons and property on or about the work. The Contractor shall assume the defense of and save harmless the City and its individual officers and agents from all claims relating to labor provided and materials furnished for the work; to injuries to any persons or property received or sustained by or from the Contractor, it's agents or employees in doing the work or arising out of the work performed or to be performed; and to any act, or neglect of the Contractor, their agents or employees. The mention of any specific duty or liability of the Contractor in this or any part of the Contract Documents shall not be construed as a limitation or restriction upon any general liability or duty imposed on the Contractor by the Contract Documents.

The Contractor shall bear all losses resulting to it on account of the amount or character of the work or because the conditions under which the work is done are different, or because the nature of the ground in which the work is done is different from what was estimated or expected, or on account of the weather, flood, elements, or other causes.

## 5. INDEPENDENT CONTRACTORS

The parties agree that the Contractor is an independent contractor as that term is commonly used and Contractor's employees are not and shall not be considered subcontractors or employees of the City and has no authority to bind the City in any manner. The Contractor shall be solely responsible for the withholding and reporting of all federal, state, and local income and employment taxes. The Contractor acknowledges that it is not insured in any manner through the City for any bodily injury or property loss whatsoever

## 6. SUBCONTRACTS

The Contractor shall not sublet, assign, or transfer this Contract or any portion thereof or any payments for work completed, without the consent of the City. Assignment or subletting any portion of this Contract shall not release the Contractor or the Contractor's bonding company from any Contract obligations. The City reserves the right to prohibit the use of any subcontractor which it may consider as being unacceptable.

The provisions of this Contract shall apply to all Subcontractors employed by the Contractor and their officers and employees in all respects as if it and they were employees of the Contractor, and the Contractor shall not be relieved from the obligations and liabilities described or required by the project plans, specifications and proposal. The work and materials furnished by Subcontractors shall be subject to the same provisions as if furnished by the Contractor. See Section 11, Superintendents and Employees, for additional requirements.

## 7. ROYALTIES, PATENTS, NOTICES, AND FEES

Contractor shall give all notices and pay all royalties and fees. It shall defend all suits or claims for infringement of any patent rights and shall save the City harmless from loss on account thereof. The Contractor shall comply with all laws, ordinances and codes applicable to any portion of the work.

In the event any claim, suit or action at law or in equity of any kind, whatsoever, is brought against the City, involving such patents or license rights, then the City shall have the right to, and may, retain from any monies due to or to become due to the Contractor, such sufficient sum as is considered necessary to protect the City against loss, and such sum may be retained by the City until such claim or suit shall have been settled and satisfactory evidence to that effect shall have been furnished to the City.

## 8. ACCEPTANCE OF CONDITIONS

If any part of the Contractor's work depends, for proper results, upon existing work or the work of another contractor, the Contractor shall notify the City Engineer before commencing work of any defects that will affect the results. Failure to so notify the City Engineer will constitute the Contractor’s acceptance of the conditions.

## 9. WORKING CONDITIONS

The Contractor shall at all times conduct, and cause all its agents, employees and sub-contractors to conduct all work in accordance with all applicable State and Federal laws and City ordinances and with minimum possible interference with the proper functioning of the activities of the City. Materials, tools, etc., shall be confined so as not to unduly encumber the premises. The Contractor shall be held to have visited the site and checked with the authorities the working conditions and the methods of carrying out the work and to have included in his proposal all costs for meeting such working conditions.

## 10. MATERIALS AND QUALITY OF WORK

Unless otherwise specified, all materials and workmanship shall be new and of the best grade of their respective kinds for the purpose and all work shall be performed in accordance with well-established practices. In certain instances specific articles and materials are specified in order to maintain compatibility with existing City materials. However, it is generally not the intent of these specifications to limit competition. Therefore, except in those instances where brand named materials are specifically required, a substitute of equal qualification may be supplied for articles, materials or equipment specified by name in these documents, upon the written approval of the City Engineer. The Engineer's decision will be final as to whether the materials or equipment offered are equal to those specified.

If not otherwise provided, material or work called for in this Contract shall be furnished and performed in accordance with well-established practices and standards recognized by architects, engineers and contractors. The Contractor shall furnish suitable tools and employ competent labor to perform the work to be done, and any labor or tools that shall not in the judgment of the Engineer, be suitable or competent to produce this result may be ordered from the work site by the Engineer, and such labor or tools shall be substituted therefore by the Contractor as will meet with the approval of the Engineer.

## 11. SUPERINTENDENTS AND EMPLOYEES

Contractor shall enforce good order among its employees and shall not employ on the work any disorderly, intemperate or unfit person or anyone not skilled in the work assigned to them. There shall be no consumption of alcoholic beverages or other illegal drugs, including marijuana in any form, by any of the Contractor's employees within the vicinity of the construction site, said vicinity to be at the discretion of the Engineer. Whenever the Engineer shall notify the Contractor that any employee on the work is, in the Engineer's opinion, careless, incompetent, disorderly, or otherwise unsatisfactory, such employee shall be discharged from work and shall not again be employed on the site except with the consent of the Engineer.

The Contractor shall at all times keep on the site of the work a competent Superintendent and any and all Foremen and Assistants. The Superintendent shall have authority to act for the Contractor. The Superintendent shall have the plans and specifications available on the site at all times. Any and all directions given to the Superintendent shall be binding as if given to the Contractor.

## 12. OTHER CONTRACTS

The City may perform other work related to the Project at the site by the City's own forces, have other work performed by utility companies or let other contracts in connection with the work and the Contractor shall properly connect and coordinate its work with the work of all other such work. The Contractor shall afford to all other parties working in the area at the City's direction, proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such work, and shall properly connect and coordinate the additional work with it.

The Contractor shall not endanger any work of others by cutting, excavating or otherwise altering their work and will only alter other work with written consent of the Engineer and the others whose work will be affected. Should the work of others interfere with that of the Contractor, the Engineer shall decide which party shall cease work for the time being or whether the work of all parties shall continue at the same time and in what manner. The duties and responsibilities under this paragraph shall also apply to all City forces, outside utility work forces and other contractors working for the City within the Project area.

If any part of the Contractor's work depends for proper execution or results upon the work of other outside forces, the Contractor shall inspect and promptly report to the Engineer any delays, defects or deficiencies in such work that render it unavailable or unsuitable for proper execution and results. The Contractor's failure to so report will constitute an acceptance of the other work as fit and proper for integration with the Contractor's work. The City shall not be liable for any damages or increased costs occasioned by the failure of other contractors to execute their work as may be anticipated by these documents.

## 13. PROTECTION AND SAFETY

Contractor shall properly protect all new and existing work from damage and shall protect all public property and private abutting property from injury or loss arising in connection with this Contract. The Contractor shall without delay make good any such damage, injury or loss, and shall defend and save the City harmless from all such damages or injuries occurring because of this work. The Contractor shall furnish and maintain all passageways, barricades, guard fences, lights, and danger signals, provide watchmen and other facilities for protection required by public authority or by local conditions or as directed by the Engineer, all at no additional cost to the City. The Contractor shall assume full responsibility for loss or damage to the work during the entire construction period from all causes whatsoever not directly due to the acts or neglect of the City. For the purposes of this section the decision of the Engineer, with respect to existing conditions and for the need for corrective action by the Contractor, shall be final.

Proper safety provisions, in accordance with MIOSHA rules and regulations, shall be adhered to at all times by the Contractor for the protection of all persons and property. The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work being performed under this Contract. The Contractor shall designate a responsible member of the Contractor's organization at the site whose duties shall include the prevention of accidents. This person shall be the Site Superintendent unless otherwise designated by the Contractor and approved by the City.

## 14. INSURANCE AND INDEMNIFICATION

The contractor, or any of their subcontractors, shall not commence work under this contract until they have obtained the insurance required under this paragraph and shall keep such insurance in force during the entire life of this contract. All coverage shall be with insurance companies licensed and admitted to do business in the State of Michigan and acceptable to the City. The requirements below should not be interpreted to limit the liability of the Contractor. All deductibles and SIR's are the responsibility of the Contractor.

The Contractor shall procure and maintain the following insurance coverage:

**Worker's Compensation Insurance** including Employers' Liability Coverage, in accordance with all applicable statutes of the State of Michigan.

**Commercial General Liability Insurance** on an "Occurrence Basis" with limits of liability not less than $1,000,000 per occurrence and aggregate. Coverage shall include the following extensions: (A) Contractual Liability; (B) Products and Completed Operations; (C) Independent Contractors Coverage; (D) Broad Form General Liability Extensions or equivalent; (E) Deletion of all Explosion, Collapse, and Underground (XCU) exclusion, if applicable. Coverage limit may be obtained using primary and excess/umbrella following form liability coverage.

**Automobile Liability Insurance** including Michigan No-Fault Coverages, with limits of liability not less than $1,000,000 per occurrence, combined single limit for Bodily Injury, and Property Damage. Coverage shall include all owned vehicles, all non-owned vehicles, and all hired vehicles.

**Additional Insured:** Commercial General Liability and Automobile Liability, as described above, shall include an endorsement stating that City is named as additional insured. It is understood and agreed by naming City as additional insured, coverage afforded is considered primary and any other insurance the City may have in effect shall be considered secondary and/or excess.

**Cancellation Notice:** All policies, as described above, shall include an endorsement stating that it is understood and agreed Thirty (30) days, Ten (10) days for non-payment of premium, Advance Written Notice of Cancellation or Non-Renewal, shall be sent to the City.

**Proof of Insurance Coverage**: The Contractor shall provide the City at the time that the contracts are returned for execution, a Certificate of Insurance as well as the required endorsements. In lieu of required endorsements, if applicable, a copy of the policy sections where coverage is provided for additional insured and cancellation notice would be acceptable.

**Expiration.** If any of the above coverages expire during the term of this contract, the Contractor shall deliver renewal certificates and endorsements to the City at least ten (10) days prior to the expiration date.

Contractor shall, to the fullest extent permitted by law pursuant to MCL 691.991(2), defend, indemnify and hold harmless the City, and its elected and appointed officers, agents, servants, and employees from any and all claims, damages, losses, expenses, liability, judgment, or liens, including reasonable attorney fees and other costs of defense arising out of any acts or omissions or the discharge, release or escape of contaminants or hazardous substances by Contractor or by anyone acting on their behalf under or in any matter connected with this agreement. Contractor's obligations to indemnify the City shall survive the expiration, non-renewal, or termination of this Agreement.

## 15. LIMITATION OF LIABILITY

Except for indemnification pursuant to Section 14, neither party shall be liable to the other, or any of their respective agents, representatives, or employees for any lost revenue, lost profits, loss of technology, rights or services, incidental, punitive, indirect, special or consequential damages, loss of data, or interruption or loss of use of service, even if advised of the possibility of such damages, whether under theory of contract, tort (including negligence), strict liability or otherwise.

## 16. BONDS

Contractor shall furnish in acceptable form, surety bonds in the amount of 100% of the contract sum as security for the faithful performance of this Contract (Performance Bond) and for the payment of all persons performing labor and furnishing materials in connection with this Contract (Labor and Material Bond). The Contractor shall also furnish in acceptable form, a surety bond in the amount of 50% of the contract sum as security for the faithful correction of all defective work for a period of one year after final acceptance of this Contract (Maintenance and Guarantee Bond). The cost of the aforesaid bonds shall be paid by the Contractor.

## 17. PERMITS

Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, inspections and certificates of occupancy. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the work which are applicable at the time of the submission of Contractor's Bid. Owner shall pay all charges of utility owners for connections for providing permanent service to the work.

## 18. CHANGES AND CHANGE ORDERS

The City shall have the right to require, by written order, changes in, additions to, or deductions from the work required by the Contract Documents, provided that if change, additions or deductions are made, the general character of the work as a whole is not changed. Contractor shall make changes in the work only as authorized in writing by the City Engineer. This does not preclude the Engineer from authorizing minor changes to the work without written notification, nor does it preclude the Engineer's authority to increase or decrease established contract quantities at contracted unit prices without written notification.

Adjustments in the Contract price, if any because of any change, addition or deduction in the work shall be negotiated between the City and the Contractor and shall be addressed at the time of ordering the change, addition or deduction. No increases in contract cost shall be allowed under any circumstances unless approved in writing by the City prior to execution of said work. Execution of the work by the Contractor or Subcontractor without written approval of additional cost constitutes an agreement by the Contractor that the work is included within existing pay items and that no additional compensation is required. Failure of the Contractor or Subcontractor to submit unit prices for additional work, in a timely manner, shall not constitute grounds for a time extension.

Where the written order diminishes the quantity of work to be done, this shall not constitute a basis for a claim for damages or anticipated profits on the work that may be dispensed with. It is understood and agreed that in case any deviation from the original contracted work is required, said change shall in no way invalidate the Contract and shall not affect or discharge the bonds furnished by the Contractor. The Contract Sum may be increased and the Contract Time may be changed only by Change Order. A Change Order signed by the Contractor indicates its agreement therewith, including the adjustment in the Contract Sum and/or the Contract Time.

## 19. INSPECTION

Contractor shall at all times permit and facilitate inspection of the work by the City Engineer. The Engineer may appoint on the job inspectors to monitor the progress of the work. The Inspector may call to the attention of the Contractor any failure to follow the Plans and Specifications that may be observed. The Inspector shall have the authority to reject materials or to suspend the work until questions on the performance of the work can be referred to and decided by the Engineer. The Inspector shall not direct the Contractor's work or employees, nor supervise the Contractor's operation. The Inspector, upon solicitation from the Contractor, may offer suggestions to the Contractor regarding construction. However, in no instance shall any action or omission on the part of the Inspector release the Contractor of the responsibility of completing the work in accordance with the Plans and Specifications.

## 20. TERMINATION FOR BREACH

The City may terminate this contract when violations are not stopped immediately and corrected within a reasonable length of time after notification by the City Engineer. In the event of such termination, the City may complete the contracted work and the Contractor will be liable for any excess cost occasioned the City thereby and in such case the City may take possession of and utilize in completing the work such materials and equipment as may be on the site and necessary therefore.

## 21. CITY'S RIGHT TO COMPLETE

It is understood and agreed that at any time the Contractor shall abandon the work or become habitually negligent of its obligations under this Contract or fail to prosecute the work with reasonable regularity so that the final completion date is not delayed, or if the provisions of this Contract are willfully and repeatedly violated, or with due notice permanent or temporary repairs are not made, the City may notify the Contractor in writing to discontinue all or any part of the work under this Contract and the City shall have the right to complete the work in part or whole, or make permanent or temporary repairs by Contract or otherwise as it may elect and take possession of any and all materials, tools and equipment found on the job and may reimburse itself for the actual cost and expense of such work by deducting said actual cost from funds due the Contractor.

## 22. PAYMENT

The City shall pay the Contractor the prices bid in the proposal, less deductions for uncompleted work, based upon measurements made by the Engineer or as otherwise stipulated herein. The quantity measurements shall be final and conclusive. Unless otherwise specified, no allowance will be made for materials furnished which are not incorporated in the finished work.

On a monthly basis, the Contractor shall submit a written itemized payment request for work completed during the previous month. When requested by the City, the Contractor shall submit receipts or other vouchers showing payments made to its materials and labor suppliers, including payments to Subcontractors, for those monthly periods for which project work has been paid by the City. Payments based on progress estimates will be made on or about the fifteenth (15th) of each month.

To assure proper performance by the Contractor and to assure payment to subcontractors and material suppliers, the City will retain ten (10%) percent of the dollar value of the work completed until the Contract is fifty percent (50%) complete. After the Contract is 50% complete, additional retainage shall not be withheld unless the City determines that the Contractor is not making satisfactory progress or for other specific cause related to the Contractor's performance under the Contract. At the time of Final Payment, all retainage shall be released to the Contractor. No partial payment shall be considered as acceptance of all or part of the work completed.

In addition the City may withhold or, on account of subsequently discovered evidence, nullify the whole or part of any certificate for progress payment to such extent as may be necessary to protect itself from loss on account of:

a) Defective work not remedied.
b) Claims filed or reasonable evidence indicating probable filing of claims.
c) Failure of the Contractor to make payments properly to subcontractors or for material or labor.
d) A reasonable doubt that the Contract can be completed for the balance then unpaid.
e) Damage of any other contractor.

When these grounds are removed, payment shall be made for amounts withheld because of them.

## 23. GUARANTEE

The Contractor shall furnish the City with a Maintenance and Guarantee Bond to correct any defects due to faulty materials or workmanship which appear in the work within one year from the date of final acceptance by the City. This does not preclude the contractor from meeting all additional warranties or guarantees required under the technical specifications that exceed the one year maintenance and guarantee period.

## 24. FINAL INSPECTION, ACCEPTANCE AND PAYMENT

The Contractor shall give written notice when work is complete and ready for final inspection and furnish: (1) the required guarantee; (2) satisfactory evidence that all payrolls, material bills and all other indebtedness connected with the work have

been paid or secured; and (3) application for final payment. The City Engineer will promptly make a final inspection and when it is determined the work is acceptable and all conditions of the Contract Documents have been satisfied, the Engineer will issue a final Certificate for Payment, the date of which shall be the date of final acceptance.

## 25. NO WAIVER OF CONTRACT

Neither the acceptance of the whole or any part of the work by the City, nor any order, measurements, or certificate by the Engineer, nor any other order by the City for payment of money, nor any payment for the whole or any part of the work by the City, nor any extension of time, nor any possession taken by the City, shall operate as a waiver for any portion of the Contract or any power therein reserved by the City, or any right to damages therein provided.

## 26. CRIMINAL BACKGROUND INVESTIGATION REQUIREMENT

The City of Northville requires satisfactory completion of a criminal background investigation for all persons having access to City facilities under this Contract. The Contractor will be required to keep a list of all employees and employees of Subcontractors who are proposed to be working under this Contract and to provide said list to the City within 10 days if requested. This list shall include the full name, date of birth, and driver's license number of each employee, and any aliases of each employee including maiden names.

The Contractor shall investigate the listed employees proposed to work under this Contract using the Michigan Internet Criminal History Access Tool (IChAT), the central registry for child abuse and neglect, the Michigan Sexual Offenders Registry, the Michigan Department of Corrections website, as well as a review of driving records and provide that information to the City upon request.

The City of Northville reserves the right to limit areas of access for individual employees, to prohibit certain employees' work in City facilities under this Contract, or to otherwise limit or restrict any employee's access to any City facility or portion of City facility, based on the information provided, as the City deems to be in its best interest.

## 27. FAIR EMPLOYMENT PRACTICES ACT

The Contractor agrees that neither it nor its subcontractors will discriminate against any employee or applicant for employment, to be employed in the performance of this Contract, with respect to hire, tenure, terms, conditions or privileges of employment, or any matter directly or indirectly related to employment, because of the applicant's race, color, religion, national origin or ancestry. This covenant is of the essence and breach of this covenant shall constitute a material breach of this Contract.

## 28. SANITARY FACILITIES

The Contractor shall provide and maintain in a neat and sanitary condition, accommodations for the Contractor's employees and the Engineer necessary to comply with the requirements and regulations of the Federal, State and local health authorities, and shall take the precautions necessary to avoid creating unsanitary conditions. Temporary sanitary facilities shall be removed from the project by the Contractor before the acceptance of the work. The construction, maintenance and removal of all temporary sanitary facilities shall be by the Contractor at the Contractor's expense.

## 29. ESTIMATED QUANTITIES

The quantities of the various classes of work to be done and materials to be furnished under this Contract, which have been estimated and stated elsewhere herein, are approximate and only for the purpose of comparing on a uniform basis the bids offered for the work under this Contract. Neither the City, its Engineers, nor its agents, are to be held responsible should any of the said estimated quantities be found to be at variance with what was actually performed during the construction of the work. The Contractor shall make no claim for anticipated profit, nor for loss of profit, or for any additional compensation of any type, or for reimbursement of any cost or expense of any type, because of the difference between the quantities of various classes of work actually done or materials actually delivered, and the estimated quantities as set forth in the Contract.

# TECHNICAL SPECIFICATIONS AND SPECIAL PROVISIONS

The Technical Specifications, Special Provisions and Contract Drawings have been prepared by (Consultant). The remainder of the front end documents have been prepared by the City of Northville.

The Technical Specifications for this project shall be in accordance with the 2012 STANDARD SPECIFICATIONS FOR CONSTRUCTION for the Michigan Department of Transportation, hereinafter referred to as the “STANDARD SPECIFICATIONS”.

## TECHNICAL SPECIFICATIONS

# SECTION 013323 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

## PART 1 - GENERAL

### 1.1 REQUIREMENTS INCLUDED:

A. Submit Shop Drawings, Product Data and Samples required by the Contract Documents.

### 1.2 RELATED REQUIREMENTS:

A. All applicable sections of the specification.

B. Conditions of the Contract.

C. Designate in the construction schedule, or in a separate coordinated schedule, the dates for submission and the dates that reviewed Shop Drawings, Product Data and Samples will be needed.

### 1.3 SHOP DRAWINGS:

A. Drawings shall be presented in a clear and thorough manner.

1. Details shall be identified by reference to sheet, detail, and schedule numbers shown on Contract Drawings.

### 1.4 PRODUCT DATA:

A. Preparation:

1. Clearly mark each copy to identify pertinent products of models.
2. Show performance characteristics and capacities.
3. Show dimensions and clearances required.
4. Show wiring or piping diagrams and controls.

B. Manufacturer's Standard Schematic Drawings and Diagrams:

1. Modify drawings and diagrams to delete information which is not applicable to the work.
2. Supplement standard information to provide information specifically applicable to the work.

### 1.5 SAMPLES:

A. Office Samples shall be of Sufficient Size and Quantity to Clearly Illustrate:

1. Functional characteristics of the product, with integrally related parts and attachment devices.
2. Full range of color, texture and pattern.

### 1.6 CONTRACTOR RESPONSIBILITIES:

A. Review shop drawings, product data and samples prior to submission.

B. Determine and Verify:

1. Field measurements
2. Field construction criteria
3. Catalog numbers and similar data

4. Conformance with specifications

C. Coordinate each submittal with requirements of the work and of the Contract Documents.

D. Notify the Owner's Representative in writing, at time of submission, of any deviations in the submittals from requirements of the Contract Documents.

E. Begin no fabrication or work which requires submittals until return of submittals with Owner's Representative or Architect's approval.

1.7 SUBMISSION REQUIREMENTS:

A. Make submittals promptly in accordance with approved schedule and in such sequence as to cause no delay in the work or in the work of any other Contractor.

B. Number of Submittals Required:

1. Shop Drawings: Submit the number of drawings that the Contractor requires, plus two (2) additional drawings that will be retained by the Owner’s Representative.
2. Product Data: Submit the number of copies that the Contractor requires, plus two (2) copies that will be retained by the Owner's Representative.
3. Samples: Submit the number stated in each specification section.

C. Submittals Shall Contain:

1. The date of submission and the dates of any previous submissions.
2. The Project title and Parcel number.
3. Contract identification.
4. The Names of:

   a. Contractor
   b. Supplier
   c. Manufacturer

5. Identification of the product, with the specification section number.
6. Field dimensions, clearly identified as such.
7. Relation to adjacent or critical features of the work or materials.
8. Applicable standards, such as ASTM or Federal Specification numbers.
9. Identification of deviations from Contract Documents.
10. Identification of revisions on resubmittals.
11. An 8" x 3" blank space for Contractor and Owner's Representative / Architect's stamps.
12. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of products, field measurements and field construction criteria and coordination of the information within the submittal with requirements of the work and of Contract Documents.

1.8 RESUBMISSION REQUIREMENTS:

A. Make any corrections or changes in the submittals required by Owner's Representative and resubmit until approved.

B. Shop Drawings and Product Data:

1. Revise initial drawings or data and resubmit as specified for the initial submittal.
2. Indicate any changes which have been made other than those requested by the Owner's Representative.

C. Samples: Submit new samples as required for initial submittal.

1.9 DISTRIBUTION:

A. Distribute reproduction of Shop Drawings and copies of Product Data which carry the Owner's Representative's or Architect's stamp of approval to:

1. Job site file
2. Record Documents file
3. Other affected Contractors
4. Subcontractors
5. Supplier or Fabricator

B. Distribute samples which carry the Owner's Representative's or Architect's stamp of approval as directed by the Owner's Representative or Architect.

1.10 OWNER'S REPRESENTATIVE OR ARCHITECT DUTIES:

A. Review submittals with reasonable promptness and in accord with schedule.

B. Affix stamp and initials or signature and indicate requirements for resubmittal, or approval of submittal.

C. Return submittals to Contractor for distribution, or for resubmission.

PART 2 - PRODUCTS – Not Applicable

PART 3 - EXECUTION – Not Applicable

END OF SECTION 013323

# SECTION 015639 - TREE AND PLANT PROTECTION

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, General and Supplemental Requirements, which are hereby made a part of this Section.

### 1.2 DESCRIPTION OF WORK:

A. Extent of tree and plant protection as is shown on drawings and by provisions of this Section.

B. Related Work Specified Elsewhere: Refer to the entire project manual for additional contract requirements.

### 1.3 DEFINITIONS:

A. Protective Barrier: A temporary device installed during the full period of construction to protect existing vegetation from damage or disturbance.

B. Damage: Physical change to the site or its vegetation caused by equipment, materials, labor or grading operations which has occurred after onsite work operations have commenced.

C. Drip-Line: The outer perimeter of the plant canopy projected on the ground plane.

D. Existing Vegetation: Any existing tree, shrub or ground cover presently on site and which will remain.

E. Protection: Means of protecting existing site vegetation from trespass, damage or disturbance by use of barriers or other means necessary to prevent trespass, damage or disturbance.

### 1.4 SUBMITTALS:

A. Certification: Submit written certification by qualified arborist that trees and plants indicated to remain have been protected during course of construction and in accordance with recognized standards and that where damage did occur, trees and plants were promptly and properly treated. Indicate which damaged trees and plants (if any) are incapable of retaining full growth potential and are recommended to be replaced.

B. Certification: Submit written certification indicating the individual selected to lead the tree preservation and trimming procedures, as well as excavation around existing root systems holds the qualifications and credentials as outlined in 1.5, A, below.

C. Product Data: Submit manufacturer product data for all materials to be used as outlined on the contract drawings. If required for use per documents submit product data for:

1. TGR
2. Ground Protection Matting
3. Geogrid
4. Filter Fabric

1.5 QUALITY ASSURANCE:

A. Arborist Qualifications: Engage an ISA board certified master arborist or a registered consulting arborist with the American Society of Consulting Arborists who has successfully completed tree protection and trimming to perform or directly oversee the following work:

1. Remove branches from trees that are to remain if required by contract documents or the arborist's recommendations.
2. Recommend procedures to compensate for loss of roots and perform initial pruning of branches to accommodate new construction.
3. Recommend procedures for excavation and grading work where adjacent to established trees and plants.
4. Perform tree and plant repair work for damage incurred by new construction.
5. Pruning practices shall conform with recommendations "Structural Pruning: A Guide For The Green Industry"; Published by Urban Tree Foundation, Vasalia, California; most current edition.
6. Root pruning shall be in conformance with ANSI A300 (part 8); most current edition.
7. The contractor shall re-execute any work that fails to conform to the requirements of the contract and shall remedy defects due to faulty materials or workmanship upon written notice from the owner's representative, at the soonest possible time that can be coordinated with other work and seasonal weather demands. Corrective measures shall be at the contractor's expense.

1.6 PROJECT CONDITIONS:

A. Temporary Protection: Provide temporary fencing, barricades or other suitable guards located outside to protect trees and other plants that are to remain from damage.

B. Root Systems: Do not store construction materials, debris, or excavated material within drip line of trees to remain. Do not permit vehicles or foot traffic within drip line to prevent excessive compaction of soil over root systems.

C. Underground Coordination: Coordinate the relocation of any irrigation lines and heads currently present (if applicable) or new conduits, new utility lines or structures that are in conflict with tree locations and their protection means. Root systems shall not be altered to fit around underground lines or conduits. Notify the owner's representative of any conflicts encountered prior to proceeding.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Barriers: Plastic safety fence 4'-0" high.

1. Support barriers with 6'-0" steel fence posts spaced not more than 8'-0" o.c.

B. Tree Pruning Compound: Waterproof, antiseptic, elastic and free of kerosene, coal tar, creosote and other substances harmful to plants.

C. Drainage Fill: Selected stone or gravel to be non-limestone, washed and graded to pass a 3-inch sieve and retained on a 1-inch sieve.

D. Topsoil: See Section 329119 - Topsoil.

E. Tree Growth Regulator: (TGR) Use only if specifically instructed to do so on the contract drawings.

1. Cambistat 25C

F. Ground Protection Matting: Matting for vehicle and work protection shall be heavy duty matting designed for vehicle loading over tree roots. Use only if specifically instructed to do so on the contract drawings.

1. Alturnamats as manufactured by Alturnamats, Inc. Franklin, PA or approved equal.

G. Geogrid: Geogrid shall be woven polyester fabric with PVC coating, uni-axial or bi-axial geogrid, inert to biological degradation, resistant to naturally occurring chemicals, alkalis and acids. Use only if specifically instructed to do so on the contract drawings.

1. Miragrid 2XT as manufactured by TenCate Nicolon, Norcross, GA or approved equal.

H. Filter Fabric: Filter fabric shall be non-woven polypropylene fibers, inert to biological degradation and resistant of naturally occurring chemicals, alkalis and acids. Use only if specifically instructed to do so on the contract drawings.

1. Mirafi 135N as manufactured by Ten Cate Nicolon, Norcross, GA or approved equal.

I. Mulch: Mulch to be single processed bark mulch, dark brown in color. Mulch shall not be reused for finished landscape installation and shall be disposed of legally off site at the contractor's expense.

## PART 3 - EXECUTION

### 3.1 EXAMINATION AND PREPARATION:

A. Examine the site, tree, plant and soil conditions. Notify the Owner's Representative in writing of any conditions that may impact the successful tree and plant protections that is the intent of this section.

B. The tree and plant protection area is defined as all areas indicated on the tree protection plan. Where no limit of the tree and plant protection area is defined on the drawings, the limit shall be the drip line (outer edge of the branch crown) of each tree projected to the ground.

C. Protect tree root systems from damage due to noxious materials caused by run-off or spillage during mixing, placement or storage of construction materials. Protect root systems from flooding, eroding or excessive wetting resulting from watering operations. The soil moisture level shall be checked and maintained as follows:

1. Volumetric soil moisture level, in all soils within the tree and plant protection area shall be maintained above permanent wilt point to a depth of at least 8 inches. No soil work or other activity shall be permitted within the tree and plant protection area when the volumetric soil moisture is above field capacity. The permanent wilt point and field capacity for each type of soil texture shall be defined as follows (numbers indicate percentage volumetric soil moisture).

| Soil type | Permanent wilt point v/v | Field capacity v/v |
|---|---|---|
| Sand, Loamy sand, Sandy loam | 5-8% | 12-18% |
| Loam, Sandy clay, Sandy clay loam | 14-25% | 27-36% |
| Clay loam, Silt loam | 11-22% | 31-36% |

| | | |
|---|---|---|
| Silty clay, Silty clay loam | 22-27% | 38-41% |

a. Volumetric soil moisture shall be measured with a digital, electric conductivity meter. The meter shall be the Digital Soil Moisture Meter, DSMM500 by General Specialty Tools and Instruments, or approved equivalent meter.

2. The Contractor shall confirm the soil moisture levels with a moisture meter. If the moisture is too high, suspend operations until the soil moisture drains to below field capacity.

D. Do not allow fires under or adjacent to trees or other plants that are to remain.

E. Prune branches from trees that are to remain if required to clear new construction as follows:

1. Where directed by landscape architect or arborist extend pruning operations to restore natural shape of entire trees or plants.
2. Cut branches with sharp pruning instruments; do not break or chop.
3. All pruning activities are to be reviewed by the landscape architect or arborist prior to commencement.

3.2 EXCAVATION AROUND TREES:

A. Prior to any excavation into the existing grade within 10 feet of the limit of the tree and plant protection area, root prune existing trees to a depth of 24” below existing grade in alignment following the edges of the tree and plant protection area or as directed by the landscape architect or arborist.

1. Using a rock saw, chain trencher or similar trenching device, make a vertical cut in location and to depth as outlined above.
2. After completion of the cut, make clean cuts with a lopper, saw or pruner to remove all torn root ends on the tree side of the excavation, and backfill the trench immediately with existing soil, filling all voids and eliminating all air gaps.
3. If excavating within the dripline of existing trees for installation of new topsoil or planting backfill mix, all excavation shall be by hand equipment and or air spade to prevent damage to existing root structure.

B. Excavate within proximity of trees only where indicated. Do not machine excavate within drip-line.

C. Where excavating for new construction is required within drip-line of trees, hand excavate to minimize damage to root systems. Provide sheeting at excavations if required. Use narrow-tine spading forks and comb soil to expose roots.

1. Relocate roots in backfill areas wherever possible. If large, main lateral roots are encountered, expose beyond excavation limits as required to bend and relocate without breaking. If encountered immediately adjacent to location of new construction and relocation is not practical, cut roots approximately 3 inches back from new construction. Cut roots with sharp pruning instruments; do not break or chop.

D. Do not allow exposed roots to dry out before permanent backfill is placed; provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in moist condition and protect from damage until permanently relocated and covered with earth.

E. Where trenching for utilities is required within drip-line, tunnel under or around roots by hand digging or use of air spade. Do not cut main lateral roots or tap roots; cut only small roots that

interfere with installation of new work. Cut roots with sharp pruning instruments; do not break or chop.

F. Prune branches to balance loss to root system caused by damage or cutting of root system per the direction of the landscape architect or a certified arborist.

3.3 INSTALLATION OF GEOGRIDS, FILTER FABRIC, MATTING AND MULCH:

A. Install geogrids, filter fabric, matting and mulch in areas and depths as shown on the plans and details or as directed by the owner's representative. In general, it is the intent of this specification to provide the following levels of protection:

1. All areas within the tree and plant protection area are to remain undisturbed unless absolutely necessary to complete new construction operations. Any disturbance within the tree and plant protection area is to be reviewed and approved by the landscape architect prior to proceeding.
2. In areas where foot traffic or storage of lightweight materials is anticipated to be unavoidable, provide a layer of filter fabric under 5 inches of mulch.
3. In areas where occasional light vehicle traffic is anticipated to be unavoidable, provide a layer of geogrid under 8 inches of mulch.
4. In areas where heavy vehicle traffic is unavoidable, provide a layer of geogrid under 8-12 inches of mulch and a layer of ground protection matting over the mulch.

B. In the above requirements, light vehicle traffic is defined as a track skid steer with a ground pressure of 4 psi or lighter. A heavy vehicle is any vehicle with a tire or track pressure of greater than 4 psi. Lightweight materials are any packaged material than can be physically moved by hand into the location. Bulk materials such as soil or aggregates shall never be stored within the tree and plant protection area.

C. The landscape architect shall approve the appropriate level of protection. Refer to the contract drawings for specified measures.

3.4 GRADING AND FILLING AROUND TREES:

A. Maintain existing grade within canopy drip line of trees unless otherwise indicated.

B. Lowering Grades: Where existing grade is above new finish grade shown around trees, gradually slope grade away from trees as recommended by Arborist. Do not reduce grade more than 6 inches beneath canopy of tree.

1. Prune branches to stimulate root growth and to compensate for loss of roots. Provide subsequent maintenance during the contract period as recommended by arborist. Provide owner with written instructions as recommended by arborist. Provide owner with written instructions for recommended long-range maintenance procedures to be followed after completion of construction operations.

C. Raising Grades:

1. Minor Fills: Where existing grade is 6 inches or less below elevation of finish grade shown, use topsoil fill material specified. Place in single layer and do not compact; hand grade to required finish elevations.
2. Moderate Fills: Where existing grade is more than 6 inches, but less than 12 inches below finish grade elevation, place a layer of drainage fill on existing grade before placing topsoil. Carefully place against trunk of tree approximately 2 inches above existing finish grade elevation and extend not less than 18 inches from tree trunk on all sides. For balance of area within drip-line perimeter, place drainage fill to an elevation 6 inches

below proposed grade and completely fill with a layer of topsoil to finish grade elevation. Do not compact drainage fill or topsoil layers greater than 85% modified proctor; hand grade to required elevations.

3.5 TREE AND PLANT MAINTENANCE:

A. Maintain trees and plants including fertilizing and watering as required in the project manual.

1. The Contractor shall be fully responsible to ensure that adequate water is provided to all plants to be preserved during the entire construction period. Adequate water is defined to be maintaining soil moisture above the permanent wilt point to a depth of 8 inches or greater.
2. The Contractor shall adjust the automatic irrigation system, if available, and apply additional water, using hoses or water tanks as required.
3. Periodically test the moisture content in the soil within the root zone to determine the moisture level.

B. During the construction period, control any plants that seed in and around the fenced tree and plant protection area at least three times a year.

1. All plants in and around the fenced tree and plant protection area that are not shown on the planting plan or on the tree and plant protection plan to remain shall be considered as weeds.

C. At the end of the construction period provide one final weeding of the tree and plant protection Area.

D. Monitor all plants to remain for disease and insect infestations during the entire construction period. If disease or infestations become present, notify the landscape architect and owner’s representative immediately and provide a licensed arborist’s recommendation for solutions. All disease and insect control required to keep the plants in a healthy state shall follow the principles of Integrated Plant Management (IPM). All pesticides shall be applied by a certified pesticide applicator.

3.6 DISPOSAL:

A. Burning removed tree trimmings, branches, and roots is not permitted on site.

B. Remove excess excavation, trees, plants, and trimmings and dispose of off Owner’s property.

3.7 CLEANING:

A. During tree and plant protection work, keep the site free of trash, pavements reasonably clean and work area in an orderly condition at the end of each day.

1. Immediately clean up any spilled or tracked soil, fuel, oil, trash or debris deposited by the Contractor from all surfaces within the project area.

B. Once tree protection work is complete, wash all soil from pavements and other structures. Ensure that mulch is confined to planting beds.

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

D. Remove and dispose of all excess mulch, soil, drainage stone, tree protection material, and packaging, brought to the site by the Contractor.

E. At the end of the construction period or when requested by the Owner's Representative remove all fencing, wood chips or mulch, geogrids and filter fabric, trunk protection and or any other Tree and Plant Protection material.

3.8 DAMAGE OR LOSS TO EXISTING PLANTS OR TREES TO REMAIN:

A. Any trees or plants designated to remain and which are damaged by the Contractor shall be replaced by the Contractor at their own expense.

1. All trees and plants shall be installed per the requirements of Specification Section 329300 - Plants and maintained and guaranteed for 1 year.

B. Plants that are damaged shall be considered as requiring replacement or appraisal as follows:

1. The damage affects more than 25% of the crown.

2. The damage affects more than 25% of the trunk circumference, or root protection area.

3. The tree is damaged in such a manner that the tree could develop into a potential hazard. Trees and shrubs to be replaced shall be removed by the Contractor at their own expense.

C. The owner's representative may engage an independent arborist to assess any tree or plant that appears to have been damaged to determine their health or condition.

D. Any tree that is determined to be dead, damaged or potentially hazardous by the Owner's arborist and upon the request of the Owner's Representative shall be immediately removed by the Contractor at no additional expense to the owner. Tree removal shall include clean-up of all wood parts and grinding of the stump to a depth sufficient to plant the replacement tree or plant, removal of all chips from the stump site and filling the resulting hole with topsoil.

E. Trees and plants shall be replaced with a similar species and of equal caliper inches as removed. Multiple trees or plants may be required.

F. Any remedial work on damaged existing plants recommended by the consulting arborist shall be completed by the Contractor at no cost to the owner. Remedial work shall include but is not limited to: soil compaction remediation and vertical mulching, pruning and or cabling, insect and disease control including injections, compensatory watering, additional mulching, and could include application tree growth regulators (TGR).

G. Remedial work may extend up to two years following the completion of construction to allow for any requirements of multiple applications or the need to undertake applications at required seasons of the year.

END OF SECTION 015639

# SECTION 017400 – CLEANING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and to General and Supplemental Conditions, hereby made a part of this Section.

### 1.2 DESCRIPTION:

A. The Contractor, at all times, shall keep the premises free from accumulation of waste materials or rubbish caused by his operations. At the completion of the work, he shall remove all his waste materials and rubbish from and about the project as well as all his tools, construction equipment, machinery and surplus materials.

B. If the Contractor fails to clean up at the completion of the work, the Owner may do so as provided in Paragraph 3.4 of the General Conditions and the cost thereof shall be charged to the Contractor.

C. Coordinate and direct the cleaning of all Subcontractors.

### 1.3 DISPOSAL REQUIREMENTS:

A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations and anti-pollution laws.

## PART 2 - PRODUCTS

### 2.1 MATERIALS:

A. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.

B. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.

C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

## PART 3 - EXECUTION

### 3.1 COLLECTION AND DISPOSAL:

A. Establish and enforce a daily system for collecting and disposing of waste materials from construction areas and elsewhere at project on site. Do not hold collected materials at site for periods of more than 7 days nor for periods of more than 3 days during hot weather (when daily temperatures can be expected to rise above 80 degrees F). Handle hazardous, dangerous, unsanitary, contaminating, polluting and similar harmful wastes separately from inert materials by containerizing in an appropriate manner. Do not bury or burn waste materials on Owner's property.

### 3.2 FINAL CLEANING:

A. Employ skilled workmen for final cleaning.

B. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.

C. Prior to final completion, or Owner occupancy, Contractor shall conduct an inspection of exposed interior and exterior surfaces and all work areas, to verify that the entire work is clean.

END OF SECTION 017400

# SECTION 023000 - SUBSURFACE INVESTIGATION

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, General and Supplementary Requirements, which are hereby made a part of this Section.

### 1.2 WORK INCLUDED:

A. Provide all labor, materials, necessary equipment and services to complete the subsurface investigation, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

B. The subsurface investigation for conditions of the project site is the sole responsibility of the Contractor. In preparing the proposal, the Contractor shall make all subsurface or surface investigations necessary to provide proper background and knowledge to determine the nature and extent of work required.

C. All known surface and subsurface data shown on the documents is based on information provided on site survey prepared by Alpine Engineering, 46892 West Road, Suite 109, Novi, MI 48377, Ph: 248-926-3701. Owner or Owner’s Representative makes no warranties or guarantees, as to the accuracy or completeness of the survey, nor concerning the nature of materials to be encountered on the site.

D. Refer to soil borings report as prepared by G2 Consulting Group, 1866 Woodlsee Street, Troy, MI 48083, Ph: 248-680-0400, for soil conditions encountered. Report does not cover nor guarantee all potential soil conditions on site, but only provides a general reporting of those soils encountered at each boring.

E. Owner or Owner’s Representative provides all known subsurface information, and makes no warranties or guarantees concerning the nature of materials to be encountered on the site.

F. Related Work Specified Elsewhere: Refer to the entire project manual for additional contract requirements.

## PART 2 - PRODUCTS – Not Applicable

## PART 3 - EXECUTION – Not Applicable

END OF SECTION 023000

# SECTION 055200 - HANDRAILS AND RAILINGS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and to General and Supplemental Conditions, hereby made a part of this Section.

### 1.2 DESCRIPTION OF WORK:

A. Extent of handrails and railings is shown on drawings.

B. Types of Handrails and Railing Systems Required Include:

1. Steel pipe handrails and guardrails

### 1.3 SYSTEM PERFORMANCE REQUIREMENTS:

A. Structural Performance of Handrails and Railing Systems: Design, engineer, fabricate and install handrails and railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials for handrails, railing systems, anchors and connections. Apply each load to produce the maximum stress in each of the respective components comprising handrails and railing systems.

1. Top Rail of Guardrail Systems: Capable of withstanding the following loads applied as indicated:

a. Concentrated load of 300 lbs. applied at any point non-concurrently vertically downward or horizontally.
b. Uniform load of 100 lbs. per linear ft. applied non-concurrently, vertically downward or horizontally.
c. Concentrated and uniform loads above need not be assumed to act concurrently.

2. Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:

a. Concentrated load of 200 lbs. applied at any point non-concurrently, vertically downward or horizontally.
b. Uniform load of 50 lbs. per linear ft. applied non-concurrently, vertically downward or horizontally.
c. Concentrated and uniform loads above need not be assumed to act concurrently.

3. Infill Area of Guardrail Systems: Capable of withstanding a horizontal concentrated load of 200 lbs. applied to one sq. ft. at any point in the system including panels, intermediate rails balusters, or other elements composing the infill area.

a. Above load need not be assumed to act concurrently with uniform horizontal loads on top rails of railing systems in determining stress on guard.

### 1.4 SUBMITTALS:

A. Product Data: Manufacturer's technical data for products and processes used in handrails and railing systems, including finishes and grout.

B. Shop Drawings: Show details of fabrication and installation for each type and material of handrail and railing system required including plans, elevations, sections, profiles of rails, fittings, connections and anchors.

1. Provide templates for anchor and bolt installation by others.
2. Include structural computations evidencing compliance of handrails and railing systems with design loadings indicated.

C. Samples: Prepare samples of each type of metal finish required on metal of same thickness and alloy indicated for final work. Where finish involves normal color and texture variations, include sample sets composed of two or more units showing limits of such variations expected in completed work.

1. Include 6" long samples of each distinctly different railing member including handrails, top rails, posts and balusters. Include samples of fittings and brackets if requested by Architect.

1.5 QUALITY ASSURANCE:

A. Single Source Responsibility: Obtain handrails and railing systems of each type and material from a single manufacturer.

B. Design Responsibility: Engage a qualified Professional Engineer to prepare or supervise the preparation of structural computations for handrails and railing systems to determine compliance with structural performance requirements indicated.

1. Engineer Qualifications: A Professional Engineer who is licensed to practice in jurisdiction where Project is located and who is experienced in providing structural engineering service of the kind required for work of this section.

1.6 STORAGE:

A. Store handrails and railing systems in clean, dry location, away from uncured concrete and masonry, protected against damage of any kind. Cover with waterproof paper, tarpaulin or polyethylene sheeting; allow for air circulation inside the covering.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide handrails and railing systems of one of the following:

1. Steel Pipe Railing System Manufacturers:

a. Aluminum Tube Railings, Inc.
b. Architectural Art Mfg., Inc.
c. Julius Blum & Co., Inc.
d. Craneveyor Corp.
e. KDI Paragon Inc.
f. Lifeguard Railings, Inc.
g. Potts Mfg. Div., Flight Systems
h. Tri-Tech Inc.
i. Wagner: R & B Wagner, Inc.
j. York Metal Fabricators, Inc.

2.2 METALS:

A. General: Comply with standards indicated for forms and types of metals indicated or required for handrail and railing systems components.

B. Steel:
1. Pipe: ASTM A 53
2. Finish:
a. Surface Preparation: Remove loose scale, rust, grease, oil, moisture or other foreign materials to properly prepare the surface for subsequent coating application.
1) Remove mill scale, rust and dirt following SSPC SP2 for hand cleaning and SSPC SP3 for power tool cleaning.
b. Paint:
1) Minimum one coat of rust-inhibitive primer FS-TT-P-645 Alkyd Type, Zinc Chromate, Paint Primer
2) Painted finish to be determined. Submit samples for landscape architect review.

2.3 MISCELLANEOUS MATERIALS:

A. Nonshrink Nonmetallic Grout: Pre-mixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

B. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded, complying with applicable AWS specifications, and as required for color match, strength and compatibility in fabricated items.

C. Fasteners: Use fasteners of same basic metal as the fastened metal, unless otherwise indicated. Do not use metals which are corrosive or incompatible with materials joined.

1. Provide concealed fasteners for interconnection of handrail and railing components and for their attachment to other work, except where otherwise indicated.

D. Anchors and Inserts: Provide anchors of type, size and material required for type of loading and installation condition shown, as recommended by manufacturer, unless otherwise indicated. Use nonferrous metal of hot-dipped galvanized anchors and inserts for exterior locations and elsewhere as required for corrosion resistance. Use toothed steel or expansion bolt devices for drilled-in-place anchors.

E. Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic)

F. Zinc Chromate Primer: FS TT-P-645

2.4 FABRICATION:

A. General: Fabricate handrails and railing systems to design, dimensions and details shown. Provide handrail and railing members in sizes and profiles indicated, with supporting posts and brackets of size and spacing shown, but not less than required to comply with requirements indicated for structural performance.

B. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Welded Connections: Fabricate stainless steel handrails and railing systems for interconnections of members by welding. Use welding method which is appropriate for metal and finish indicated and develops strength required to comply with structural performance criteria. Finish exposed welds and surfaces smooth, flush and blended to match adjoining surfaces.

D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain profile of member throughout entire bend without buckling, twisting or otherwise deforming exposed surfaces of handrail and railing components.

E. Brackets, Flanges, Fittings and Anchors: Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings and anchors for interconnection of handrail and railing members to other work, unless otherwise indicated.

1. Furnish inserts and other anchorage devices for connecting handrails and railing systems to concrete or masonry work. Fabricate anchorage devices which are capable of withstanding loadings imposed by handrails and railing systems. Coordinate anchorage devices with supporting structure.
2. For railing posts set in concrete provide preset sleeves of steel, not less than 6" long and inside dimensions not less than 1/2" greater than outside dimensions of post, with steel plate forming bottom closure.

2.5 METAL FINISHES:

A. Comply with NAAMM "Metal Finishes Manual" for recommendations and designations of finishes, except as otherwise indicated.

B. Stainless Steel:

1. AISI No. 8 Finish: Mirror-like, reflective, non-directional polish.

C. Aluminum:

1. High Performance Organic Coating: AA-C12C42R1x (cleaned with inhibited chemicals, conversion coated with acid-chromate-fluoride-phosphate treatment and painted with organic coating specified below). Prepare, pretreat and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's instructions.

a. Fluorocarbon Coating: Manufacturer's standard multicoat thermocured system, composed of specially formulated primer and fluorocarbon topcoats; complying with AAMA 605.2.
b. Color and Sheen: Custom matching Architect's sample.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Installer must examine the areas and conditions under which handrails and railings are to be installed and notify the General Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.2 PREPARATION:

A. Coordinate setting drawings, diagrams, templates, instructions and directions for installation of anchorages, such as sleeves, concrete inserts, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete as masonry construction. Coordinate delivery of such items to project site.

B. Field Measurements: Take field measurements prior to fabrication.

3.3 INSTALLATION, GENERAL:

A. Fit exposed connections accurately together to form tight, hairline joints.

B. Perform cutting, drilling and fitting required for installation of handrails and railing systems. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Do not weld, cut or abrade surfaces of handrails and railing components which have been coated or finished after fabrication and are intended for field connection by mechanical means without further cutting or fitting.

C. Field Welding: Comply with applicable AWS specification for procedures of manual shielded metal-arc welding, for appearance and quality of welds made, and for methods used in correcting welding work. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed welded joints smooth and restore finish to match finish of adjacent rail surfaces.

D. Corrosion Protection: Coat concealed surfaces of aluminum which will be in contact with grout, concrete, masonry, wood or dissimilar metals, with a heavy coat of bituminous paint or zinc chromate primer.

E. Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated but not less than that required by design loadings.

3.4 ANCHORING POSTS:

A. Concrete-Anchored Posts in Sleeves: Insert posts in preset sleeves cast into concrete and fill annular space between posts and sleeve solid with nonshrink, nonmetallic grout, mixed and placed to comply with grout manufacturer's directions.

3.5 RAILING CONNECTIONS:

A. Welded Connections: Use fully welded joints for permanently connecting railing components by welding. Cope or butt components to provide 100 percent contact or use manufacturer's standard fittings designed for this purpose.

3.6 ANCHORING RAILING ENDS:

A. Anchor railing ends into stonework as shown.

B. Expansion Joints: Provide expansion joints at locations indicated or, if not indicated, at intervals not to exceed 40 feet. Provide slip-joint interval sleeve extending 2" beyond joint on either side; fasten internal sleeve securely to one side, locate joint within 6" of post.

3.7 ADJUSTING:

A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections and abraded areas of shop paint and paint exposed areas with same material.

3.8 PROTECTION:

A. Protect finishes of railing system and handrails from damage during construction period by use of temporary protective coverings approved by railing manufacturer. Remove protective covering at time of Substantial Completion.

B. Restore finished damaged during installation and construction period so that no evidence remains of correction work. Return items which cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units as required.

END OF SECTION 055200

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and to General and Supplemental Conditions, hereby made a part of this Section.

1.2 WORK INCLUDED:

A. Provide all labor, materials, necessary equipment, and services to complete the Joint Sealants work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS."

B. Related Work Specified Elsewhere: Refer to the entire project manual for additional contract requirements.

1.3 SAMPLES AND CERTIFICATES:

A. Submit the Following Samples:

| Quantity | Size | Description |
|---|---|---|
| 3 | 6" long | Filler for polyurethane |
| 3 | Color sample charts | Polyurethane sealants |

B. Submit the Following Certificates for Compliance:

| Description | Standards |
|---|---|
| Polyurethane | Per Specifications (TT-S-00227E, Type Class A |
| (two components) | ASTM C-920, TYPE M, Grade P, Class 25 |

1.4 COOPERATION:

A. Work of this section shall be provided and coordinated as required through procedures of construction that will insure safety.

1.5 GUARANTEE:

A. Furnish written guarantee for all sealant work stating that said work shall be free from any defects of material and/or workmanship for a period of five (5) years, commencing on the date of final completion and acceptance.

B. Said Guarantee Shall Further State that Sealants are Guaranteed Against:

1. Adhesive or cohesive failure of sealants in joints where movement is under maximum of ±25% extension or ±25% compression for two component polyurethane base sealant.
2. Any crazing greater than 3 mils in depth developing on the surface of the sealant material.
3. Any staining of the surfaces adjacent to the joints, by the sealants, primers, or joint filler materials, by migration through the adjacent materials in contact with them.
4. Any puncture, abrasion or tear failure due to pedestrian or vehicular traffic in self-leveling polyurethane base sealant installed at traffic surfaces.
5. Any visible chalking or color change on the cured surface of the sealant.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER'S AND MATERIALS:

A. Multi component chemically curing, polyurethane base sealant shall be manufactured to meet the specified requirements by the following manufacturer:

1. Tremco Corp., Contact: Construction Technical Services, Telephone (216) 292-5000, Fax (216) 766-5535.

B. Manufacturer's label shall indicate the expiration date of use of sealants or manufacturer shall otherwise attest to the date of manufacture. The period of time lapsed shall not be longer than six (6) months for polyurethane from the date of manufacturer to the date of usage on the job.

C. Primers where required shall be as recommended by the sealant manufacturer.

D. The color of sealants shall be as selected by Architect or as called for on drawings.

E. Bond-breakers where required shall be as recommended by the sealant manufacturer.

2.2 HORIZONTAL EXPANSION JOINTS: (Subject to Pedestrian Traffic):

A. Sealant at horizontal joints of self-leveling consistency, meeting or equal to requirements specified by the following manufacturer:

1. Tremco THC 900 or 901 multi-component chemically and polyurethane based sealant per Fed. Spec. TT-S-00227E, Type 1, Class A, ASTM C-920 Type M, Grade P, Class 25.

2.3 FILLER MATERIAL FOR HORIZONTAL JOINTS:

A. Filler material shall be a non-impregnated closed-cell, supporting type, compressible resilient, free from tar, asphalt, oil and other foreign substances. Filler shall be a closed-cell polyethylene foam, or isomeric polymer foam (polystyrene will not be allowed). Filler shape shall be such that sealant in joint is fully supported against puncture or pressure, but of design to prevent sealant from being forced out of joint by contraction. Filler shall have characteristics of not bonding with sealant, surface of filler. Filler shall be at least 25% wider than width of joint measured in field to which it is applied. Compression on such installed filler shall be sufficient so as to allow no displacement.

1. Closed-cell polyethylene joint filler foam backer rod material shall comply with ASTM D-1622.
2. Where joint design, or depth of joint will not permit the use of joint backing, a bondbreaker tape must be installed to prevent three-sided adhesion. An adhesive backed polyethylene tape should be used.

2.4 EXPANSION JOINT CAPS:

A. Removable expansion joint caps manufactured by:

1. Contie
2. Greenstreak

B. Used with expansion joint filler, ready for sealant after removal.

PART 3 - EXECUTION

3.1 JOINT DIMENSIONS:

A. The depth of a joint is defined as the distance from the outside face of the joint to closest point of joint filler, whether joint is rod shaped.

B. Minimum size of joint should be four times the anticipated movement. Minimum joint dimension is 3/8" (9.5mm) x 3/8" (9.5mm), to allow for adequate cleaning and priming.

C. For joints 1/2" (13mm) and wider, the depth of the sealant should be no more than 1/2" (13mm) deep.

D. Joints to receive sealants shall be never less than 1/4" depth by 1/4" width.

E. Joints larger than the above stated minimum dimensions shall be provided in accordance with manufacturer's standard printed specifications and recommendations.

F. The General Contractor shall determine and provide joints of dimensions as specified herein before.

3.2 JOINT INSPECTION:

A. Inspect all joints which are to receive work of this section and notify Architect of dimensions and/or any existing conditions which will prevent satisfactory installation and performance of the sealants.

B. Commencement of work on any joint shall be considered full acceptance of dimensions and condition of said joint.

C. Joints to be sealed shall be thoroughly cleaned of mortar or any other foreign material in an approved manner before any sealant materials are applied. Any coating from metal surfaces shall be removed by use of solvent recommended by manufacturer of metal. Solvent shall not be allowed to air dry without wiping.

D. Concrete and masonry surfaces shall be fully cured, free of release agents, curing compounds, loose aggregate and other surface treatments. Treated surfaces shall be tested for adhesion before proceeding with sealant work.

E. Joint spaces and surfaces shall be thoroughly dry before installation of sealant materials. Unless approved means of drying joint is employed, do not install sealant material when temperature is below 40 degrees F or during and after rain and fog. To test for free moisture, run paper towel or paper napkin through joint. Paper shall be completely dry. Any alkaline seepage from fresh concrete shall be washed away, surface dried.

3.3 GENERAL WORKMANSHIP AND APPLICATION:

A. Use thoroughly experienced workmen in the application and as per manufacturer's recommendations.

B. Primer shall be used as it comes from can, unadulterated. Apply as per manufacturer's printed directions and/or recommendations. Prime joints before insertion of joint filler material.

C. Fill joint with filler material so that depth and width of joint have relationships as noted hereinafter under "Joint Dimensions".

D. When installing rod stock filler, roll filler into joint. Rod filler in final position shall not be twisted.

E. Bond-breaker strip shall be used in joints where sufficient room for back-up does not exist.

F. In mixing sealant compound components, do not whip excessive air into said materials. Mix strictly as recommended by manufacturer.

G. Sealant materials shall be applied within "application life" recommended by manufacturer for prevailing temperature and humidity conditions. Do not retemper.

H. Protect exposed surfaces adjacent to joints to prevent permanent staining or other damage to adjacent work. Be fully responsible for any staining and/or other damage caused under work of this section to any adjacent work.

I. If manufacturer indicates there is any possibility of color of sealant material being changed by use of wetting agents while tooling, Contractor shall dry tool.

J. Joints shall be lightly tooled into place immediately after application, when necessary to give concave shaped surface.

K. Immediately after application of sealants, thoroughly clean adjacent surfaces which may have been soiled, as per sealant manufacturer recommendations. Leave work in neat and clean conditions to full satisfaction of Architect.

3.4 GENERAL PERFORMANCE:

A. Sealants: Except as otherwise indicated, joints are required to establish and maintain airtight and waterproof continuous seals on a permanent basis, within recognized limitations of wear and aging as indicated for each application. Failures of installed sealants to comply with these requirements will be recognized as failures of materials and workmanship.

END OF SECTION 079200

# SECTION 312216 - FINE GRADING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and General and Supplemental Requirements which are hereby made a part of this section.

### 1.2 DESCRIPTION OF WORK:

A. Extent of fine grading is shown on drawings and by provision of this section. Refer to civil engineer drawings for site grading.

B. Type of work required includes the following:

1. Verification of rough grades established
2. Excavation as required
3. Fine grading
4. Compaction
5. Correction of grade, if required
6. Cleaning

C. Related work specified elsewhere: Refer to the entire project manual for additional contract requirements.

### 1.3 PROJECT CONDITIONS:

A. The contractor shall visit the site and review all existing conditions. The contractor shall be responsible for his own subsurface investigations, as necessary, to satisfy requirements of this section. All subsurface investigations shall be performed only under time schedules and arrangements approved in advance by the landscape architect or owner's representative.

B. Obtain drawings showing proposed final grading.

C. Verify that sub-grade elevations established during mass grading are within (1) inch above or below sub-grade requirements as outlined below. If sub-grade elevations are within tolerance, the landscape contractor shall make whatever adjustments are necessary to provide finish grades consistent with the requirements of the grading drawings and specifications.

D. Sub-Grade Elevations: Sub-grade elevations are required to be established to within (1) inch of the following requirements.

1. Seeded:
   a. 4” of topsoil (by landscape contractor); sub-grade elevation shall be held 4” below finish grade for seeded lawns.

E. Before starting site operations verify that earlier contractors have disconnected all temporary utilities which might interfere with the fine grading work.

F. Locate all existing, active utility lines traversing the site and determine the requirements for their protection. Preserve in operating condition all active utilities adjacent to or transversing the site that are designated to remain.

G. Observe rules and regulations governing respective utilities in working under requirements of this section. Adequately protect utilities from damage, remove or relocate as indicated, specified or required. Remove, plug or cap inactive or abandoned utilities encountered in excavation. Record location of active utilities.

H. Dust Control: Use all means necessary to prevent dust from construction operations from being a nuisance to adjacent property owners and from damaging finish surfaces on adjacent building, paving, etc. Methods used for dust control are subject to approval by the owner's representative.

I. Protection: Use all means necessary to protect curbs, gutters, sprinklers, utilities and vegetation designated to remain, and, in the event of damage, immediately make all repairs, replacements and dressings to damaged plants necessary to the approval of the landscape architect. The contractor shall incur all cost for the replacement of damaged objects and vegetation.

J. Maintain grade stakes set by others until parties concerned mutually agree upon removal.

K. Schedule all work in a careful manner with all necessary consideration for adjoining property owners and the public.

L. Coordinate schedule with other contractors to avoid conflicts with their work.

1.4 QUALITY ASSURANCE:

A. Requirements of all applicable building codes and other public agencies having jurisdiction upon the work.

B. Primary emphasis should be given to the aesthetic appearance and functioning of berming and swales, as directed by the landscape architect or owner's representative. The contractor shall employ skilled personnel and any necessary equipment to insure that finish grading is smooth, aesthetically pleasing, drains well and is ideal for receiving seed and plant materials.

PART 2 - MATERIALS

2.1 IMPORTED SOIL:

A. Use imported soil, unless otherwise directed by owner's representative, free from debris, sod, biodegradable materials and other deleterious materials. The contractor shall insure that all topsoil has sufficient percolation and surface drainage to support grasses and plant material and that extreme compaction occurs only in areas to receive paving.

B. In areas to receive seeded lawn, verify that soil is scarified to depth of 4” to support and encourage rooting.

PART 3 - EXECUTION

3.1 EXCAVATION:

A. Excavate where necessary to install conduit, subsurface drainage pipe and materials and planting mix, or to enhance, percolation and surface drainage as required.

B. Materials to be excavated are unclassified.

C. Remove entirely any existing obstructions after approval by the landscape architect or owner's representative.

D. Remove from site and dispose of debris and excavated material not required.

3.2 FINE GRADING:

A. The contractor shall establish finished grades as shown on the landscape plan and or grading plan or as directed by the landscape architect, including areas where the existing grade has been disturbed by other work.

B. Grade the finish surface of all planted areas to meet the grades shown on the drawings, allowing the finished grades to remain higher than the grades on the grading plan to accomodate settlement over the first year. The contractor is responsible to provide the finished grades as shown on the grading plans at end of the one year warranty and is responsible at his expense for all repair work as required to provide these grades.

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

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

E. Finished grading shall be smooth, aesthetically pleasing, drain well and ready to receive lawn and other plant material to full satisfaction of the owner's representative or landscape architect.

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

3.3 COMPACTION:

A. Compact each layer of fill in designated areas with approved equipment to achieve a maximum density at optimum moisture, AASHTO T 180 - latest edition.

1. Under landscaped areas, compaction shall be 80-85% of maximum density.

B. No backfill shall be placed against any masonry or other exposed building surface until permission has been given by the owner's representative, and in no case until the masonry has been in place seven (7) days.

C. Compaction in limited areas shall be obtained by the use of mechanical tampers or approved hand tampers. When hand tampers are used, the materials shall be deposited in layers not more than four inches thick. The hand tampers used shall be suitable for this purpose and shall have a face area of not more than 100 square inches. Special precautions shall be taken to prevent any wedging action against masonry or other exposed building surfaces.

3.4 CORRECTION OF GRADE:

A. Bring to required grade levels areas where settlement, erosion or other grade changes occur. Adjust grades as required to provide positive drainage away from buildings and to prevent ponding around the buildings and on pavements.

B. Remove all rock or objectionable material larger than 1" in any direction prior to commencing landscaping.

C. The contractor shall be responsible for stabilizing grades by approved methods prior to landscaping, and shall be responsible for correction of grades as mentioned above, and clean up of any wash outs or erosion.

3.5 CLEANING:

A. All areas over which hauling operations have been conducted shall be kept clean on a daily basis. Promptly remove materials spilled on pavement.

B. Upon completion of fine grading, remove from the site and legally dispose of all trash and debris including any material removed during grade preparation.

C. Restore existing areas damaged by operations under the contract. Restoration shall include fine grading as required to match existing grade, landscape repair, and maintenance of restored areas.

END OF SECTION 312216

# SECTION 320536 - LANDSCAPE MAINTENANCE AND WARRANTY STANDARDS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and to General and Supplemental Conditions, hereby made a part of this Section.

### 1.2 DESCRIPTION OF WORK:

A. Extent of landscape maintenance areas are shown on sheets L300 & L301 and by provisions of this section.

B. Types of work required include the following:

1. Plant maintenance
2. Lawn maintenance
3. Prairie, Native Grass or Forb maintenance
4. Irrigation system operation
5. Replacements
6. Warranty

C. Related Work Specified Elsewhere: Refer to the entire project manual for additional contract requirements.

### 1.3 ACCEPTANCE OF INSTALLATION:

A. At the completion of all landscape installation, or pre-approved portions thereof, the landscape contractor shall request in writing an inspection for acceptance of installation in which the landscape contractor, landscape architect and owner's representative shall be present. After this inspection a "Punch List" will be issued by the landscape architect and/or owner's representative. After completion of punch list items, the landscape architect, contractor and owner's representative shall re-inspect the project and upon satisfactory completion of punch list items, issue a written statement of acceptance of installation and establish the beginning of the project warranty period.

B. It is the responsibility of the landscape contractor to make the above written request for inspection of installation in a timely fashion. If there is plant material loss prior to the landscape contractor's written request for inspection of installation, the landscape contractor shall make all replacements of this dead material at no additional cost. These replacements are not considered to be the required one (1) replacement of dead plant material by the landscape contractor during the two (2) year project warranty period, as outlined below.

C. Landscape work may be inspected for acceptance in parts agreeable to owner's representative and landscape architect provided work offered for inspection is complete, including maintenance as required.

D. For work to be inspected for partial acceptance, supply a written statement requesting acceptance of this work completed to date.

E. To ensure warranty standards, the following maintenance procedures shall be executed during construction and for the full project warranty period.

F. The standard project warranty period for all plant material including seeded lawn shall be two (2) full years from the date of acceptance.

G. Prairie, Native seeded areas shall have a standard project warranty period of two (2) full growing seasons, plus the spring of the third growing season as outlined within this specification.

1.4 QUALITY ASSURANCE:

A. The landscape contractor shall warranty all plants and lawn areas through construction and for a period of two years after date of acceptance of installation against defects including death and unsatisfactory growth, except for defects resulting from neglect by owner, abuse or damage by others, or unusual phenomena or incidents which are beyond landscape contractor's control.

B. The landscape contractor shall warranty plants due to overwatering or underwatering during the maintenance and warranty period.

1.5 PROJECT CONDITIONS

A. The project maintenance and warranty period begins upon written acceptance of the project installation by landscape architect and owner's representative.

B. The landscape contractor accepts responsibility for the irrigation system operation (if provided), watering schedule, watering amounts and monitoring system for duration of maintenance and warranty period.

C. Landscape contractor shall be responsible for only one (1) replacement of any plant materials after project acceptance date, see Section 1.3, that are dead or in the opinion of the landscape architect are in an unhealthy or unsightly condition, or having lost natural shape, resulting from die back, excessive pruning, excessive or deficient watering practices, or inadequate or improper maintenance as part of the warranty. Prior to any replacements landscape contractor shall review individual plants in question with landscape architect and determine the reason for plant demise.

D. Replacements must meet specifications i.e. quality, species of plant material and planting procedures to receive approval of replacement materials by landscape architect.

E. Costs for replacements are assumed part of bid quotations and therefore will not result in an additional cost to owner or landscape architect.

F. Areas damaged as result of replacement operations are to be restored by contractor at no cost to the owner.

PART 2 - PRODUCTS

A. All products as noted within applicable specification sections.

PART 3 - EXECUTION:

3.1 MAINTENANCE OF PLANTS:

A. The Contractor shall be responsible for keeping guy wires taut, plants straight and plumb, raise tree balls which settle, furnish and apply fertilizer and sprays as necessary to keep the plantings growing vigorously and free of disease and insects until the end of the warranty period. All

evergreens shall be watered thoroughly and wilt proofed in the fall to insure they do not go into the winter dry.

B. Keep planting beds free of weeds during warranty period. All portions of weed plants shall be removed including roots. Removal can be done by physical removal and/or supplemental by use of herbicides.

C. Winter Evergreen Protection:

1. Winter evergreen protection for trees and shrubs shall be provided by the contractor during each winter season which occurs during the warranty period.
2. Prior to winter freeze conditions contractor shall check root ball moisture level for all evergreen plantings and water in all plantings as required to provide optimum moisture level.
3. Supplement mulch as necessary to provide 3” depth mulch in tree and shrub beds and 2” in perennial and groundcover beds
4. Apply wilt-proof in December when temperatures are above freezing per manufacturer’s instructions. Only apply a ½ solution to Arborvitae plants.
5. At the end of November install treated (green) burlap mounted to 2” x 2” wood stakes at +/- 4’-0” o.c. with wood lath and roofing nails. Burlap height to be 6” above top of foliage, pulled taut, and be continuous to the ground without gaps. Note: Burlap may be folded in half to provide a double thickness for low hedges as approved by landscape architect.
6. Under no conditions should the treated burlap make contact with the evergreen plant material. The burlap should be stood off of the plant material 4”-6”.
7. Contractor to remove burlap and stakes in early spring when winter conditions have ceased, but no later than April 15th and provide stakes and burlap to owner.

D. Winter Sun Scald Protection: Provide protection for all thin-skinned trees (Maple, Dogwood) for the first year following planting as follows: In late fall wrap trunk with light colored commercial grade tree wrap. Remove wrap in early spring once freezing conditions have ended.

E. Winter Deer Protection: In areas where deer damage occurs, provide protection for all plantings that are moderate to high risk for deer damage as follows: Each year at the end of October install fine mesh such as bird netting around plant foliage and tie together with black zip ties and anchor into ground with stakes. Apply Deer-Pruf or other approved product. Remove netting and stakes in May.

F. The contractor shall be responsible for watering of all plantings and lawn areas throughout construction, maintenance and warranty periods. The contractor will be responsible for irrigation system operation, watering schedules, watering amounts and general monitoring of irrigation system throughout the maintenance and warranty period. Overwatering or lack of from irrigation system source is the responsibility of the landscape contractor. Plant material and lawn area loss due to over or underwatering shall be replaced in like kind by the contractor at no additional expense.

G. Remove and replace trees, shrubs, or other plants found to be dead or in unhealthy condition. Remove rejected plants and materials promptly. Make replacements following normal planting schedule. Replace trees and shrubs which are in doubt, unless, in opinion of owner's Representative and landscape architect it is advisable to extend warranty period for a full-growing season. Remove all stakes, guy wires, tree wrap paper, dead twigs and branches from tree and plant materials at the end of this warranty period.

3.2 MAINTENANCE OF SEEDED LAWN AREAS:

A. After acceptance of installation, and for the duration of the project maintenance and warranty period the landscape contractor shall continue all other maintenance procedures including

fertilizing and weeding, and other operations such as rolling, regrading, replanting, and applying herbicides, fungicides, insecticides as required to establish a smooth, acceptable lawn free of eroded or bare areas.

B. Watering: See Section 3.1.F

C. At conclusion of project warranty period and after receiving written final acceptance by owner's representative and landscape architect, the owner shall assume all seeded lawn maintenance responsibilities.

D. Unless specifically noted in the contract, mowing of seeded lawn areas shall be the owner’s responsibility.

3.3 MAINTENANCE OF MEADOW LAWN SEEDED AREAS:

A. Contractor shall provide maintenance as described in section 3.3 above for maintenance of seeded lawn areas.

B. Contractor to inform owner that seed heads should be cut off once matured, which typically occurs in June. Meadow lawn shall be maintained at a height of 8”-10” after seed heads are cut. Contractor to verify owner’s preference for meadow lawn height throughout the maintenance and warranty period and coordinate this with the lawn mowing contractor.

3.4 MAINTENANCE OF NATIVE / ORNAMENTAL GRASS MONOCULTURE PLANTINGS:

A. Refer to Section 3.1 – Maintenance of Plants for replacement plants and watering requirements during the warranty period.

B. Remove plants found to be dead or in unhealthy condition. Remove rejected plants and materials promptly. Make replacements following normal planting schedule.

C. Areas damaged as result of replacement operations are to be restored by contractor at no cost to the owner.

D. Contractor shall be responsible for site visits to inspect growing conditions and provide maintenance operations as needed to fulfill requirements as outlined herein.

E. The contractor shall apply a broadleaf specific pre-emergent herbicide twice per year, once in the spring and once in the fall as instructed by the manufacturer.

F. The contractor shall weed by hand as required and/or apply a broadleaf specific post-emergent spot spray treatment to keep planting beds free of weeds during maintenance and warranty period.

G. The contractor shall not cut the grasses in the fall. The plants shall be left “up” or standing in their entirety for the winter season.

H. The contractor shall cut the grasses in the spring to a consistent height of approximately 4”-6” with a handheld brush blade. The contractor shall not use riding equipment to cut these areas.

I. The spent material shall be blown or raked out of the beds and disposed of prior to new pre-emergent herbicide and mulch installation as required herein.

J. The contractor shall re-apply the approved mulch (if specified) as required to re-achieve specified depths. A max depth of 2 inches shall be achieved. Contractor shall take care not to

overly disturb existing mulch to prevent weed seeds from becoming established. The mulch shall be installed in the spring after specified pre-emergent has been applied.

3.5 FINAL ACCEPTANCE:

A. At the conclusion of the project warranty period the landscape contractor shall request a project inspection for final acceptance in which the landscape contractor, landscape architect and owner's representative shall be present. After this inspection a "Warranty Walk Punch List" will be issued by the landscape architect. Upon completion of all punch list items, the landscape architect and owner's representative shall reinspect the project and issue a written statement of final acceptance. Upon final acceptance the owner assumes all maintenance responsibilities for the landscape of the project.

PART 4 - PRODUCTS - Not Applicable

PART 5 - EXECUTION - Not Applicable

END OF SECTION 320536

SECTION 321213.40 – SITE AMENITY CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and to General and Supplemental General Conditions, which are hereby made a part of this Section.

1.2 DESCRIPTION OF WORK:

A. Extent of concrete paving is shown on Sheets L100,L101, L200, and includes utility pads and site furniture pads. All sidewalks and vehicular curbing – refer to civil documents.

B. Related Work Specified Elsewhere: Refer to the entire project manual for additional contract requirements.

1.3 SUBMITTALS:

A. Product Data: Submit data for proprietary material and items, including reinforcement and forming accessories, admixtures, patching compounds, joint systems and others as requested by Landscape Architect.

B. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test as specified.

1. Submit proposed design mix for each type of concrete required.

1.4 QUALITY ASSURANCE:

A. Codes and Standards: Comply with local governing regulations if more stringent than herein specified.

B. Concrete Testing Service: Employ, at Contractor's expense a testing laboratory acceptable to the Architect to perform material evaluation tests and to design concrete mixes.

C. Tests for Concrete Materials:

1. For Portland Cement, sample cement and determine chemical and physical properties by methods of test of ASTM C-150.
2. Submit written reports to the Landscape Architect for each material sampled and tested prior to the start of work. Provide the project identification name and number, date of report, name of Contractor, name of concrete testing service, source of concrete aggregates, material manufacturer and brand name for manufacturing materials, values specified in the referenced specification for each material and test results. Indicate whether or not material is acceptable for intended use.
3. Certificates of material properties and compliance with specified requirements may be submitted in lieu of testing, when acceptable to the Landscape Architect. Certificates of compliance must be signed by the materials' producer and the Contractor.

1.5 JOB CONDITIONS:

A. Traffic Control:

1. Maintain access for vehicular and pedestrian traffic as required for other construction activities.
2. Utilize flagmen, barricades, warning signs and warning lights as required.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Forms:

1. Steel, wood or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.
2. Use flexible spring steel forms or laminated boards to form radius bends as required.

B. Concrete Materials: See 2.2

C. Expansion Joint Materials: Refer to Section 079200 – Joint Sealants.

D. Anti-Spalling Compound: 50% (by volume) boiled linseed oil and 50% (by volume) commercial grade kerosene or mineral spirits.

E. Bonding Compound: Styrene butadiene or acrylic base, rewettable type.

2.2 CONCRETE MATERIALS:

A. Portland Cement: ASTM C-150, Type I

1. Type III may be used for high early strength concrete.
2. Use one brand of cement throughout project, unless otherwise acceptable to Landscape Architect.

B. Normal Weight Aggregates:

1. General: ASTM C-33 and as herein specified.

a. Local aggregates not complying with ASTM C-33, but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to Architect.

2. Fine Aggregates: Clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances.

a. Dune sand, bank run sand and manufactured sand are not acceptable.

3. Coarse Aggregate: Clean, uncoated, processed aggregate containing no clay, mud, loam or foreign matter, as follows:

a. Crushed stone, processed from natural rock or stone.
b. Washed gravel, either natural or crushed. Use of pit or bank run gravel not permitted.

c. Maximum Aggregate Size: Not larger than one-fifth of narrowest dimensions between sides of forms, one-third of depth of slabs, nor three-fourths of minimum clear spacing between individual reinforcing bars or bundles of bars.
d. Combined aggregate gradation for slabs and other designated concrete shall be 8% - 18% for large top size aggregates (1 1/2 inch) or 8% - 22% for smaller top size aggregates (1 inch or 3/4 inch) retained on each sieve below the top size and above the No. 100.

4. Supplementary Cementitious Materials:

a. Fly Ash ASTM C618, Type F may be used up to a maximum of 25% of the total cementitious content.
b. Ground Granulated Blast-Furnace Slag: ASTM C989, Grade 100 or 120 may be used up to a maximum of 40% of the total cementitious content.
c. The exact percentage of supplementary cementitious materials used shall be based on a successful test placement on-site.
d. In mass concrete, more than 2 feet thick, the usage may be 50% for fly ash and 80% for slag.

C. Water: Drinkable

D. Air-Entraining Admixture: ASTM C-260, certified by manufacturer to be compatible with other required admixtures.

1. Products: Subject to compliance with requirements, provide one of the following:

a. "AEA-92 or Air 40": Euclid Chemical Co.
b. "Sika Aer": Sika Corp.
c. "MB-VR or MB-AE": BASF Admixture Systems

E. Water-Reducing Admixture: ASTM C-494, Type A, and contain not more than 0.05% chloride ions.

1. Products: Subject to compliance with requirements provide one of the following:

a. "Eucon WR-75 or Eucon WR 91": Euclid Chemical Co.
b. "Possolith 322N": BASF Admixture Systems
c. "Plastocrete 160": Sika Chemical Corp.

F. High-Range Water-Reducing Admixture (Superplasticizer): ASTM C-494, Type F or Type G and contain not more than 0.05%chloride ions.

1. Products: Subject to compliance with requirements, provide one of the following:

a. "Daracem 100 or AdvaFlow": W. R. Grace
b. "Eucon 37/Eucon 1037, or Plastol Series": Euclid Chemical Co.
c. "Rheobuild 1000 or Glenium Series": BASF Admixture Systems

G. Water-Reducing, Non-Chloride Accelerator Admixture: ASTM C-494, Type C or E, and not contain more chloride ions than are present in municipal drinking water. The admixture manufacturer must have long-term non-corrosive test data from an independent testing laboratory (of at least a year's duration) using an acceptable accelerated corrosion test method such as that using electrical potential measures.

1. Products: Subject to compliance with requirements, provide one of the following:

a. "Accelguard 80/90 or NCA": Euclid Chemical Co.

b. Pozzutec 20+: BASF Admixture Systems

H. Water-Reducing, Retarding Admixture: ASTM C-494, Type D, and contain not more than 0.05% chloride ions.

1. Products: Subject to compliance with requirements, provide one of the following:

a. "Pozzolith Retarder": Master Builders
b. "Eucon Retarder 75 or Eucon Retarder 100": Euclid Chemical Co.
c. "Plastiment": Sika Chemical Co.

I. Certification: Provide admixture manufacturer's written certification that chloride ion content complies with specified requirements.

J. Prohibited Admixtures: Calcium chloride thyocyanates or admixtures containing more than 0.05% chloride ions are not permitted.

K. Curing materials: Liquid membrane curing compound, ASTM C-309, Type I, Class A manufactured by W.R. Meadows ph. (800) 342-5976 or equal.

2.3 REINFORCING MATERIALS:

A. Reinforcing Bars: ASTM A-615, Grade 60. (Size as shown on drawings.)

B. Welded Wire Fabric: ASTM A-185 welded steel wire fabric, 6X6W2.9 X W2.9 or size as shown on drawings.

2.4 FORMS:

A. Contractor shall be responsible for design and engineering of formwork. Formwork shall comply with local code requirements and ACI 347, “Recommended Practice for Concrete Formwork”.

B. Unless otherwise specified herein, concrete materials, mixing and placing shall conform to requirements of ACI 304 “Recommended Practice for Measuring, Mixing, and Placing Concrete”.

C. Comply with ACI 318 Building Code Requirements for Reinforced Concrete for all fabrication and application or reinforcing.

2.5 PROPORTIONING AND DESIGN OF MIXES:

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301, Section 4.3.1. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing, unless otherwise acceptable to Architect.

B. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of work. Submit mix designs on the mix design submittal form included at the end of this specification. Do not begin concrete production until mixes have been reviewed by Architect.

C. Design mixes to provide normal weight concrete with the following properties and additives:

1. Exterior Concrete: 4000 psi 28-day compressive strength; W/Cm 0.45 (0.40 if reinforced), 6% $\pm$ 1.5% air content.

D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results or other circumstances warrant; at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.

E. Admixtures:

1. Use water-reducing admixture or high range water-reducing admixture (super plasticizer) in concrete as required for placement and workability.
2. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F (10 degrees C).
3. Use high-range water-reducing admixture in pumped concrete, architectural concrete, fiber concrete and concrete with water/cementitious ratios below 0.50.
4. Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus-or-minus 1-1/2% within following limits:

    a. Concrete structures and slabs exposed to freezing and thawing, deicer chemicals or subjected to hydraulic pressure.

        1) 5.5% 1-1/2" maximum aggregate
        2) 6.0% 1" maximum aggregate
        3) 6.5% 3/4” maximum aggregate
        4) 7.0% 1/2" maximum aggregate

    b. Other Concrete (not exposed to freezing, thawing or hydraulic pressure): 2% to 4% air.

5. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.

F. Water-Cement Ratio: All concrete subject to freezing and thawing shall have a maximum water/cementitious ratio of 0.50 (4000 psi at 28 days or more). All concrete subjected to deicers and/or required to be watertight shall have a maximum water/cementitious ratio of 0.45 (4500 psi at 28 days or more). All reinforced concrete subjected to deicers shall have a maximum water/cementitious ratio of 0.40 (5000 psi at 28 days or more).

G. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Slabs and Sloping Surfaces: Not more than 3".
2. Concrete Containing HRWR Admixture (super plasticizer): Not more than 9" after addition of HRWR to site verified 2"-3" slump concrete.
3. Other Concrete: Not more than 4".

2.6 CONCRETE MIXING:

A. Ready-Mix Concrete: Comply with requirements of ASTM C-94, and as herein specified:

1. During hot weather or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C-94 may be required.

    a. When air temperature is between 85 degrees F (30 degrees C) and 90 degrees F (32 degrees C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes

and when air temperature is above 90 degrees F (32 degrees C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine the areas and conditions under which concrete curbs and paving are to be installed and notify the Landscape Architect in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.2 SURFACE PREPARATION:

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

B. Proof-roll prepared subbase surface to check for unstable areas and the need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

3.3 FORM CONSTRUCTION:

A. Set forms to the required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of the work and so that forms can remain in place at least 24 hours after concrete placement.

B. Check completed formwork for grade and alignment to the following tolerances:

1. Top of forms not more than 1/8" in 10'.
2. Vertical face on longitudinal axis, not more than 1/4" in 10'.

C. Clean forms after each use and coat with form release agent as often as required to ensure separation from concrete without damage.

3.4 CONCRETE PLACEMENT:

A. Do not place concrete until subbase and forms have been checked for line and grade. Moisten subbase if required to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

B. Place concrete using methods which prevent segregation of the mix. Consolidate concrete along the face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement or side forms. Use only square faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocation of reinforcing, dowels and joint devices.

1. Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hour, place a construction joint.

3.5 JOINTS:

A. General: Construct expansion, weakened-plane (contraction) and construction joints true-to-line with face perpendicular to surface of the concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.

1. When joining existing structure, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints, sectioning concrete into areas as shown on drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness. Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.

C. Construction Joints: Place construction joints at the end of all pours and at locations where placement operations are stopped for a period of more than 1/2 hour, except where such pours terminate at expansion joints. Use diamond dowels in construction joints of non-reinforced slabs on grade.

D. Expansion Joints: Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks and other fixed objects, unless otherwise indicated.

1. Extend joint fillers full-width and depth of joint, and not less than 1/2" or more than 1" below finished surface where joint sealer is indicated. If not joint sealer, place top joint filler flush with finished concrete surface.
2. Furnish joint fillers in one-piece lengths for the full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together.
3. Protect the top edge of the joint filler during concrete replacement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.

3.6 CONCRETE FINISHING:

A. After striking-off and consolidating concrete, smooth the surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust the floating to compare the surface and produce a uniform texture.

B. After completion of floating and when excess moisture or surface sheen has disappeared, complete surface finishing, as shown on drawings and as acceptable to Architect.

C. Do not remove forms for 24 hours after concrete has been placed. After removal, clean ends of joints and point-up any minor honeycomb areas. Remove and replace areas or sections with major defects, as directed by the Architect.

D. Work edges of slabs, back top edge of curb and formed joints with an edging tool and round to 1/2" radius, unless otherwise indicated. Eliminate tool marks on concrete surface. Install beveled sawcuts where indicated.

E. After completion of floating and when excess moisture or surface sheen has disappeared, complete surface finishing, as shown on drawings and as acceptable to Architect

3.7 CONCRETE CURING AND PROTECTION:

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

B. Curing Method: Perform curing of concrete by moist curing, by moisture-retaining cover curing and by combinations thereof, as herein specified. Use methods 1 or 2 where subsequent surface treatments will be applied to concrete.

1. Provide Moisture Curing by Following Methods:

a. Keep concrete surface continuously wet by covering with water.
b. Continuous water-fog spray.
c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.

2. Provide Moisture-Cover Curing as Follows:

a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproofing tape.

3. Provide Membrane Forming Curing Compound:

a. Apply per manufacturer’s recommendation.

C. Curing Formed Surfaces: Cure formed concrete surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

D. Curing Unformed Surfaces: Cure Unformed surfaces and other flat surfaces by use of moisture-retaining cover, unless otherwise directed.

E. Anti-Spalling Treatment: Apply compound to concrete surfaces not receiving protective sealer finish no sooner than 28 days after placement. Apply to clean, dry concrete free of oil, dirt and other foreign materials, in 2 sprayed applications. First application at rate of 40 yds. per gal.; second application, 60 sq. yds. per gal. Allow complete drying between applications.

3.8 REPAIRS AND PROTECTIONS:

A. Repair or replace broken or defective concrete as directed by the Landscape Architect.

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

C. Sweep concrete pavement and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

3.9 QUALITY CONTROL TESTING DURING CONSTRUCTION:

A. This Contractor to employ a testing laboratory to perform tests and to submit test reports.

B. Sampling and testing for quality control curing placement of concrete may include the following, as directed by Landscape Architect.

1. Sampling Fresh Concrete: ASTM C-172, except modified for slump to comply with ASTM C-94.

a. Water Content and Slump: Verify Water Content in accordance with AASHTO T-318 “Standard Method of Test for Water Content Using Microwave Oven Drying”. Test Slump in accordance with ASTM C-143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
b. Air Content: ASTM C-173, volumetric method or ASTM C-231 pressure method; one for each day's pour of each type of air-entraining concrete.
c. Concrete Temperature: Test hourly when air temperature is 40 degrees F (4 degrees C) and below, and when 80 degrees F (27 degrees C) and above; and each time a set of compression test specimens made.
d. Compression Test Specimen: ASTM C-31; one set of 3 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
e. Compressive Strength Tests: ASTM C-39; one set for each day's pour exceeding 5 cu. yds. plus additional sets for each 50 cu. yds. over and above the first 25 cu. yds. of each concrete class placed in any one day; one specimen tested at 7 days, one specimen tested at 28 days and one specimen retained in reserve for later testing if required.
f. When frequency of testing will provide less than 4 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
g. When total quantity of a given class of concrete is less than 50 cu. yd., strength test may be waived by Architect if, in his judgment, adequate evidence of satisfactory strength is provided.
h. When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
i. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive by more than 500 psi.

C. Test results to be reported in writing to Landscape Architect and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-days test.

D. Nondestructive Testing: Impact hammer, sonoscope or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

E. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Landscape Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C-42 or by other methods as directed. Contractor shall pay for such tests conducted and any other additional testing as may be required, when unacceptable concrete is verified.

F. Non-Compliant Test Reports: All test reports indicating non-compliance should be e-mailed or faxed immediately to all parties on the test report distribution list. Copies shall be on different colored paper.

END OF SECTION 321213.40

# SECTION 321543 - WATERLESS NATURAL PAVEMENT FOR PATHWAYS

## PART 1 - GENERAL

### 1.1 SUMMARY

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

1. StaLok® Paving Material aggregate pathway or patio surfacing

B. Related Sections: Refer to the entire project manual for additional contract requirements.

### 1.2 PERFORMANCE REQUIREMENTS

A. The following standards and definitions are applicable to the work of this Section to the extent referenced herein:

1. Standard Specifications: Highway Department, Standard Specifications for Highways and Bridges, latest edition.
2. ASTM: American Society for Testing and Materials.

### 1.3 SAMPLES AND SUBMITTALS

A. Sieve analysis of aggregate for pathways.

B. Samples and or shop drawings for the following:

1. Aggregate for strength and color.

C. Construction Samples:

1. Construct mock-up panels or areas for each different type of paving system as specified herein to demonstrate ability to archive types of setting bed, joints, pattern, color and texture required herein.

2. StaLok® Paving Material for aggregate pathway surfacing: Construct a 10’ x 10’ sample of finished path as directed by the Owner’s Representative on site.

3. General:
   a. Schedule mock-up construction so that mock-up can be accepted a minimum of 30 days prior to the application of paving surfaces represented by the mock-up.
   b. Locate mock-up panel(s) in areas as directed by the Owner’s Representative.
   c. Continue to construct mock-ups until acceptable mock-up is produced (at no cost to the Owner). Acceptable mock-up shall be standard for texture, color and workmanship.
   d. Use same setting bed and joint mixes used in accepted mock-up in final work unless otherwise directed by Owner’s Representative.
   e. Protect accepted mock-ups from damage until completion and acceptance of the work represented by the mock-ups.
   f. Remove mock-up panel(s) from the site at completion of the project, unless otherwise instructed by Owner’s Representative.

### 1.4 PROJECT/SITE CONDITIONS

A. Field Measurements: Each bidder is required to visit the site of the work to verify the existing conditions. No adjustments will be made to the Contract Sum for variations in the existing conditions.

1. Where surfacing is indicated to fit with other construction, verify dimensions of other construction by field measurements before proceeding with the work.
2. Before proceeding with work, notify the owner's representative in writing of unsuitable conditions and conflicts.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Installer to provide evidence to indicate successful experience in installation of StaLok® Paving Material or approval by manufacturer.

B. Manufacturer's technical representative shall visit the site at the start of an installation to ensure the installer understands the correct installation methods to use.

1.6 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty executed by the installer agreeing to repair or replace components of StaLok® Paving Material that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:

1. Premature wear and tear, provided the material is maintained in accordance with manufacturer's written maintenance instructions.
2. Failure of system to meet performance requirements.

C. Warranty Period: Contractor shall provide warranty for performance of product. Contractor shall warranty installation of product for the time of one year from completion.

D. Contractor shall provide, for a period of sixty days, unconditional maintenance and repairs as required.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. StaLok® Paving Material Waterless Natural Pavement is provided by the following manufacturer:

1. Stabilizer Solutions, Inc. 33 South 28th St., Phoenix, AZ 85034; phone (602) 225-5900, (800) 336-2468; fax (602) 225-5902; website www.stabilizersolutions.com; email info@stabilizersolutions.com

2.2 MATERIALS

B. Base Aggregate Specifications:

1. Crushed stone or gravel conforming to current MDOT specifications for Open Graded 4G Aggregate. Do not use material produced from Portland cement concrete or recycled asphalt.
2.

| U.S. Sieve No. | Percent Passing by Weight |
|---|---|
| # 1½-inch | 100 |
| # 1- inch | 85 – 100 |
| # ¾ inch | - |
| # ½ inch | 45 - 65 |
| # 8 | 15 - 30 |
| # 30 | 6 18 |
| # LBW | 0.0 – 6.0 |

C. Base Drainage Aggregate Specifications:

1. Crushed stone or gravel conforming to current MDOT specifications for Open Graded 6AA Aggregate. Material to be produiuced by crushing, washing and screening high calcium or dolomitic limestone. Do not use material produced from Portland cement concrete or recycled asphalt.
2.

| U.S. Sieve No. | Percent Passing by Weight |
|---|---|
| # 1½-inch | 100 |
| # 1- inch | 95 – 100 |
| # ¾ inch | - |
| # ½ inch | 30 - 60 |
| # 3/8 inch | - |
| # 4 | 0 - 8 |
| # LBW | 2.0 MAX. |

D. Waterless Pavement Aggregate Specifications

1. Crushed stone shall consist of inert materials that are hard, durable, with stone free from surface coatings and deleterious materials. Gradation requirements shall be as follows:
2.

| U.S. Sieve No. | Percent Passing by Weight |
|---|---|
| # ½-inch | 98 – 100 |
| # 3/8-inch | 90 – 100 |
| # 4 | 65 – 80 |
| # 8 | 48 – 63 |
| # 16 | 40 – 49 |
| # 30 | 30 – 40 |
| # 50 | 20 – 27 |
| # 100 | 10 – 18 |
| # 200 | 10 – 12 |

3. R-value minimum of 70 determined by ASTM D 2488 Methodology (R-value is a measure of wear resistance).
4. Sand equivalent – an engineering measurement of the proportion of sand to silt and clay, will stay at a range of 30-55. As determined by ASTM D 2419 methodology.
5. Dense graded crushed stone base shall be furnished and installed as required and specified under Section 02200, Earthwork and Section 02230 Granular Materials to a 6" compacted depth.

E. Steel Edging: Steel edging [1/4 inch (6.4 mm) thick by 4 inches (101.6 mm) high] with loops pressed from or welded to face to receive 15" long steel stakes.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

a. Border Concepts, Inc.
b. Collier Metal Specialties, Inc.
c. J. D. Russell Company
d. Ryerson, J. T. & Son, Inc.
e. Sure-Loc Edging Corporation

2. Color and Finish: Natural
Install per manufacturer's recommendations. Top to be flush with finish grade, alignment per drawings. All edging to be new.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Base aggregate shall be 6" thick layer of MDOT 4G crushed granular base material installed over 8" layer of MDOT 6AA wrapped in geotextile fabric on top of subgrade compacted to 95% compaction by Test Method ASTM D 1557. Compaction testing to be provided by project owner no less than one test per 2,000 square feet of pavement base layer.

B. Make any corrections necessary to base furnished and installed to bring gravel to the sections and elevations shown on the drawings.

C. Pre-soak base material with water prior to installing StaLok® Paving Material as needed to compact base.

D. Make sure proper drainage is available to ensure no standing water on surface or adjacent to StaLok® Paving Material, including downspouts when placed under roof overhang.

E. Install edging per details and manufacturer's recommendations. Top to be flush with finish grade, alignment per drawings.

### 3.2 BLENDING

A. Waterless Natural Pavement (WNP) blending shall be under the direction of a WNP manufacturer with not less than 10 years experience in the production of WNP product. WNP shall be prepared with mixing plant dedicated to WNP production and equipped with metering controls for accurate proportioning of WNP ingredients. Aggregate must be heated to 200 degrees Fahrenheit by use of drum dryer prior to blending.

B. The mixed WNP shall have a dry static coefficient of friction greater than .60. Water shall bead or form droplets on WNP surface and shed off. WNP shall set up only by compaction and can be stockpiled up to 1 month prior installation.

3.3 PLACEMENT/COMPACTION

A. Consult manufacturer if installing on slope.

B. Do not install in rainy conditions.

C. Avoid installing WNP Material below 30°F. WNP Material may form clods during transport below 60°F. Large clods may be broken apart with machinery such as front loader, or on their own if left to warm in sun. Small clods will break apart during placement and compaction.

D. Place WNP at a minimum 2”, maximum 3” compacted depth per details. Thicken material depth to 18” along exposed outside edges per details. Using a Paver Box, Paver, Crawler Paver, Asphalt Paver, Drag Box Paver, Pavement Profiler, Slip Form Paver, Pav-Saver Place Spreader, Front Loader or Equal.
1. Crown WNP or slope material to edge ¼” per foot.
2. Pockets of large aggregate may develop, inspect surface and evenly spread any 1/4” or 3/8” loose rock.

E. Compact WNP.

1. Compaction can be achieved by a 1 to 5-ton double-drum roller
2. Lightly compact making one pass.
3. Make any grade adjustments and add needed material.
4. Heavily compact material making 8 to 10 passes. Avoid turning on material with roller.
5. Use plate compactor on edges and hard to get areas. If near wall, hand tamp may be necessary.
6. Loose material shall not be present on final surface.
7. No set up or curing time is needed.

3.4 INSPECTION

A. Finished surface shall be uniform and solid, with no evidence of chipping or cracking. Compacted paving material shall be firm to full depth with no soft areas. Loose material shall not be present on the surface and no ruts shall be present. Compaction may increase with time and use. WNP shall be ready for traffic immediately and shall not require fog seal or any other sealing or curing methods.

3.5 MAINTENANCE

A. Remove debris, such as paper, grass clippings, leaves or other organic material by mechanically blowing or hand raking the surface as needed. Any plowing program required during winter months shall involve the use of a rubber baffle on the plow blade or wheels on the plow that lifts the blade 1/4" off the paving surface.

3.6 REPAIRS

A. Excavate damaged area to the depth of the WNP and square-off sidewalls.

B. If area is dry, moisten damaged portion lightly and scarify.

C. Apply pre-blended WNP to excavated area to finish grade.

D. Compact with an 8” to 10” hand tamp or 1000 lb. Roller.

END OF SECTION

# SECTION 323216.10 – PRECAST CONCRETE RETAINING WALL SYSTEM

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and to General and Supplemental Conditions, hereby made a part of this Section.

### 1.2 DESCRIPTION OF WORK:

A. Extent of retaining walls is shown on landscape and structural drawings.

B. Type of Retaining Walls Required Include the Following:

1. Segmental concrete masonry retaining walls with soil reinforcement as indicated on structural drawings.

C. Related Work Specified Elsewhere: Refer to the entire project manual for additional contract requirements.

### 1.3 SYSTEM PERFORMANCE REQUIREMENTS:

A. Structural Performance: Refer to structural engineering drawings and specifications.

### 1.4 REFERENCES:

A. AASHTO M288 Geotextile Specifications for Highway Applications.

B. ACI 301 Structural Concrete

C. ACI 318 Building Code Requirements for Reinforced Concrete

D. ASTM A615 Reinforcing Steel

E. ASTM C33 Concrete Aggregates

F. ASTM C39 Compressive Strength of Concrete

G. ASTM C94 Ready-Mixed Concrete

H. ASTM C231 Air Content of Concrete

I. ASTM C1776 Wet-Cast Precast Modular Retaining Wall Units

J. ASTM D448 Sizes of Aggregate for Road and Bridge Construction

K. ASTM D698 Laboratory Compaction Characteristics of Soil Using Standard Effort

L. ASTM D1557 Laboratory Compaction Characteristics using Modified Effort

M. ASTM D6637 Tensile Properties of Geogrid

1.5 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data and other information for each retaining wall material or product required, including but not limited to soil reinforcement if required by engineer, and filter fabric.

B. Shop Drawings: Submit shop drawings for approval indicating layout and construction of proposed retaining wall. Design drawings shall be prepared by manufacturer for segmental concrete retaining walls. Show height, length, profile, soil reinforcement, base and drainage fill.

C. Samples for Verification Purposes: Sets for each color, finish and pattern of concrete unit required. Include sample of concrete wall units showing the full range of variations expected for approval prior to ordering of concrete wall units.

1.6 QUALITY ASSURANCE:

A. Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

B. Industry Standards: Comply with recommendations of National Concrete Masonry Association (NCMA) and the Interlocking Concrete Pavement Institute (ICPI) as applicable.

C. Installer Qualifications: Engage an experienced installer with a minimum of (5) years experience who has completed segmental retaining walls similar in material, design and extent to that indicated for Project that has resulted in construction with a record of successful in-service performance.

1.7 PROJECT CONDITIONS:

A. Test borings and other exploratory operations may be performed by Retaining Wall Contractor, at the Retaining Wall Contractor's option; however, no change in the contract sum will be authorized for such additional exploration.

B. Protection: Protect existing structures, utilities, sidewalks, pavements, bridges and other facilities in areas of work. Barricade open excavations and provide warning lights. Comply with regulations and requirements of authorities having jurisdiction.

1.8 DELIVERY, STORAGE AND HANDLING:

A. Contractor shall check the materials upon delivery to assure proper material has been received.

B. Contractor shall prevent excessive mud, wet concrete and like materials from coming in contact with the precast modular blocks.

C. Contractor shall protect the materials from damage. Damaged material shall not be incorporated in the project.

PART 2 - PRODUCTS

2.1 WALL UNITS:

A. Wall units shall be Outcropping precast modular block units as produced by a manufacturer licensed and authorized by the precast modular block licensor to produce the units.

B. Wall units shall meet Outcropping block specifications and be made from wet-cast concrete in accordance with ASTM C1776, per the following chart, and as modified herein.

| Freeze-Thaw Exposure Class* | Air Content % | 28-Day Compressive Strength *psi (MPa)* | Maximum Water Cement Ratio | Min. Concrete Temp. at Placement *°F (°C)* |
|---|---|---|---|---|
| Negligible | 1½ to 4½ | 4000 (27.6) | 0.45 | 50 (10) |
| Moderate | 3½ to 6½ | 4000 (27.6) | 0.45 | 50 (10) |
| Severe | 4½ to 7½ | 4000 (27.6) | 0.45 | 50 (10) |
| Very Severe | 4½ to 7½ | 4500 (30.0) | 0.40** | 50 (10) |

All Outcropping products shall use frost-free aggregate.

*Exposure class is as described in ACI 318. “MODERATE” describes concrete that is exposed to freezing and thawing cycles and occasional exposure to moisture. “SEVERE” describes concrete that is exposed to freezing and thawing cycles and in continuous contact with moisture. “VERY SEVERE” describes concrete that is exposed to freezing and thawing cycles and in continuous contact with moisture and exposed to deicing chemicals. Exposure class should be specified by owner/purchaser prior to order placement.

**For Very Sever exposure, flay ash, other pozzolan, and slag shall be limited as described in ACI 318 4.2.3.

Notwithstanding anything stated above, all material used in the wall units must meet applicable ASTM and ACI requirements for exterior concrete.

C. Exterior block dimensions, as measured in accordance with ASTM C1776, shall be uniform and consistent. Maximum dimensional deviations shall be 1/8 inch (3 mm) or 2%, whichever is less, excluding the architectural surface. Maximum width (face to back) deviation including the architectural surface shall be 1/2 inch (13 mm).

D. Exposed faces shall have a textured finish. Other surfaces to be smooth form or troweled surface type.

E. Shear heels shall be intact and free from cracks or other defects. Chips, holes, and cracks in the unit smaller than the dimensions described in ASTM C1776 may be permitted.

F. Wall units shall be manufactured by High Format, 05481 South US-31, Charlevoix, MI 49720. Representative: Rob Schillinger, Cell (231) 350-0220.

a. Product: Outcropping Wall
b. Color: TBD
c. Cap: No Cap

2.2 AGGREGATE AND FILL MATERIAL:

A. Leveling pad shall be crushed stone, meeting the requirements of ASTM No. 57 aggregate, or similar material as approved by the Engineer.

B. Free draining backfill material shall be washed stone, shall be placed to a minimum of 12 inches (305 mm) width behind the back of the wall blocks, and shall extend vertically from the Leveling Pad to an elevation 4 inches (102 mm) below the top of wall. Free draining backfill shall meet the requirements of ASTM No. 57 or approved similar material.

C. Backfill material and reinforced soil material (if needed) shall be suitable soils meeting the strength properties as required by the design and be approved by the geotechnical engineer.

Site excavated soils may be used if suitable and approved by the geotechnical engineer. Suitable soils generally include predominately granular soils with non-plastic fines. Unsuitable soils, those with a PI>6, organic soils, saturated soils, and frost susceptible soils, shall not be placed within a 1 to 1 influence area from the base of the wall.

D. Where additional fill is needed, the Contractor shall submit sample and specifications to the Engineer for approval.

2.3 DRAINAGE:

A. Internal and external drainage shall be evaluated by the Professional Engineer who is responsible for the final wall design.

B. Perforated drain pipe should be a minimum of 4 inches (102 mm) in diameter, meeting the requirements of AASHTO M278 (corrugated or smooth-walled PVC) or AASHTO M252 (corrugated polyethylene).

2.4 GEOTEXTILE & GEOGRID:

A. Non-woven geotextile fabric shall meet the requirements for Class 2 construction survivability in accordance with AASHTO M288.

B. Geogrid reinforcement shall be a woven or knitted PVC-coated geogrid manufactured from high-tenacity PET polyester fiber with an average weight greater than 25,000 (Mn > 25,000) and a carboxyl end group less than 30 (CEG < 30). The geogrid shall be furnished in prefabricated roll widths of certified tensile strength by the manufacturer. The ultimate tensile strength of reinforcement shall be as shown of the plans and measured in accordance with ASTM D6637.

C. Use ParaWeb 2D 30kN strap, consisting of a 3.25-inch (83 mm) wide, geosynthetic strap composed of 100% multifilament polyester yarn encased in a polyethylene sheath, with a tensile strength of 6,750 lbs (30kN) in the machine direction.

2.5 CAST-IN-PLACE CONCRETE BACKFILL:

A. Cast-in-place concrete backfill shall be ready-mixed concrete meeting the requirements of ASTM C94 with a minimum 28-day compressive strength of 2,500 psi (17.2 MPa).

B. Rebar ties shall consist of 18-inch (457 mm) No. 4 reinforcing steel, meeting the requirements of ASTM A615, Grade 60, bent into a U shape, 9 inches (229 mm) per leg.

PART 3 - EXECUTION

3.1 EXCAVATION:

A. Contractor shall excavate to the lines and grades shown on the construction drawings.

3.2 FOUNDATION SOIL PREPARATION:

A. Native foundation soil shall be compacted to 95% of standard proctor maximum dry density (ASTM D698) or 90% of modified proctor maximum dry density (ASTM D1557) prior to placement of the leveling pad material.

B. In-situ foundation soil shall be examined by the geotechnical engineer to ensure that the actual foundation soil strength meets or exceeds assumed design strength. Foundation soil found to

be unsatisfactory shall be removed and replaced with acceptable, compacted material, or otherwise improved, to the satisfaction of the geotechnical engineer.

3.3 LEVELING PAD PLACEMENT:

A. Leveling Pad shall be placed as shown on the construction drawings to ensure a level, hard surface on which to place the first course blocks.

B. Leveling Pad shall be placed on undisturbed native soils or suitable replacements fills as directed by the geotechnical engineer.

C. Leveling Pad shall be placed in uniform maximum lifts of 6 inches (152 mm) and compacted by a minimum of three passes of a vibratory compactor capable of exerting 2,000 lbs (8.9 kN) of centrifugal force to the satisfaction of the geotechnical engineer. Pad shall be constructed to the proper elevation to ensure the final elevation shown on the plans.

D. Leveling Pad shall have a 6-inch (152 mm) minimum depth or deeper as designed by the Professional Engineer responsible for the wall. Pad dimensions shall extend beyond the blocks in all directions to a distance at least equal to the depth of the pad or as designed by the Engineer.

E. Place perforated drain pipe in leveling pad and connect to suitable gravity outlet, as shown on the design.

3.4 UNIT INSTALLATION:

A. The first course of wall units shall be placed on the prepared Leveling Pad with the aesthetic surface facing out and the back edges tight together. All units shall be checked for level and alignment as they are placed. Outcropping blocks shall be placed with the back of the blocks offset from the back of wall reference line based on their unit height. A 6-inch (152 mm) high Outcropping block shall be offset 4.5 inches (114 mm) from the reference line, a 12-inch (305 mm) high Outcropping block shall be offset 3 inches (76 mm) from the reference line, an 18-inch (457 mm) high Outcropping block shall be offset 1.5 inches (38 mm) from the reference line, and a 24-inch (610 mm) high Outcropping block shall be set with the back of the block flush with the reference line.

B. Ensure that units are in full contact with Leveling Pad. Proper care shall be taken to develop straight lines and smooth curves on base course as per wall layout.

C. The backfill in front and back of entire base row shall be placed and compacted to firmly lock them in place. Check all units again for level and alignment. All excess material shall be swept from top of units.

D. Install next course of wall units on top of base row. Position blocks to be offset from seams of blocks below. Blocks shall be placed fully forward so shear heels and back of lower block are engaged. Check each block for proper alignment and level. Backfill to a 12-inch (305 mm) width behind the block with Free Draining Backfill. Spread backfill in uniform lifts not exceeding 8 inches (203 mm). Employ methods using lightweight compaction equipment that will not disrupt the stability or batter of the wall. Hand-operated plate compaction equipment shall be used around the block and within 3 feet (0.91 m) of the wall to achieve consolidation. Compact backfill to 95% of standard proctor maximum dry density (ASTM D698) or 90% of modified proctor maximum dry density (ASTM D1557) within 2% of its optimum moisture content.

E. Non-woven geotextile fabric shall be placed between the back of the HIGH FORMAT® blocks and the free draining backfill. Additional non-woven geotextile fabric shall be placed between the Free Draining Backfill and retained soil if required in the detailed wall design.

F. Install each subsequent course in like manner. Repeat procedure to the extent of wall height.

G. Allowable construction tolerance at the wall face is 2 degrees vertically, 3-inch (76 mm) maximum, and 1 inch in 10 feet (25 mm in 3.0 m) horizontally.

H. All walls shall be installed in accordance with local building codes and requirements.

3.5 GEOGRID INSTALLATION:

A. Construct wall and place and compact reinforced soil to the elevation of the first layer of geogrid.

B. Place geogrid layers as shown in the project details extending into the reinforced soil zone to the design length.

C. Install geogrid with the strong direction (roll or machine direction) into the reinforced soil zone and not parallel to the wall. Place geogrid as a continuous length from its connection at the blocks to the back of the reinforced zone. Do not splice or overlap the geogrid.

D. Pull the geogrid taut to eliminate any folds and pretension the geogrid. Backfill from face to back of reinforced soil zone to maintain a taut condition.

E. Connect Outcropping blocks to reinforced soil mass using Paraweb straps. As installation of reinforced fill progresses, wrap Paraweb strap around each lift hook in the Outcropping blocks. Use length of strap as required for the site-specific design. Extend straps into reinforced fill, with tail ends separated horizontally 12 to 24 inches (305 to 610 mm). Backfill over Paraweb straps similar to over geogrid, as described above.

F. Do not operate rubber tire nor track vehicles on the geogrid without a minimum 9 inches (229 mm) of reinforced soil over the geogrid or ParaWeb straps. Avoid sudden braking or turning over the reinforced soil zone.

3.6 CAST-IN-PLACE CONCRETE BACKFILL INSTALLATION:

A. Install Outcropping units (without backfill) to height of concrete backfill, in accordance with section 3.4.

B. Place rebar ties around each lift hook cast into the Outcropping units.

C. Place formwork to the required width and height of cast-in-place concrete backfill section. Alternatively, concrete backfill can be cast neat against the edge of excavation, provided a suitable drainage composite is utilized between edge of excavation and concrete.

D. Place concrete in accordance with ACI 301 to required height, aligning rebar ties to extend into the concrete. Place concrete in lifts, as required to prevent displacement of Outcropping units.

E. Once concrete has cured, backfill in accordance with section 3.4.

3.7 MAINTENANCE:

A. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and re-establish grades in settled, eroded and rutted or otherwise damaged areas. In damaged compacted areas, scarify surface, reshape and compact to required density prior to further construction.

3.8 DISPOSAL OF EXCESS AND WASTE MATERIALS:

A. Remove trash, debris excess soil materials and waste materials and legally dispose of off Owner’s property.

END OF SECTION 323216

SECTION 323253 - DRY LAYED STONE OUTCROPPINGS AND STEPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions sections, apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

A. Perform wall construction as indicated on drawings. The work includes:

1. Grading and compaction of subgrade and aggregate base
2. Filter fabric membrane
3. Drainage stone backfill
4. Wall construction

B. Related Work Specified Elsewhere: Refer to the entire project manual for additional contract requirements.

1.3 QUALITY ASSURANCE:

A. Contractor to have previous experience of 5 years minimum in dry laid wall construction. On-site sample mockup of wall construction shall be provided for approval by the Landscape Architect prior to construction.

B. Contractor must hire, at his expense, a licensed Land Surveyor to layout and stake horizontal alignment, and set base elevation of entire wall utilizing curve data and elevations shown on drawings. The AutoCAD base file for the project will be made available for GPS survey layout purposes.

C. Contractor shall submit product data / cut sheets for all materials required to construct the retaining walls.

D. Contractor shall submit sieve analysis for aggregate base course and drainage fill.

E. Contractor shall provide at their expense third party compaction testing of subgrade and aggregate base course for approval by Landscape Architect.

1.4 DELIVERY, STORAGE AND HANDLING:

A. Material to be stored on site in approved location by the Gneral Contractor. Coordinate staging and installation with other Contractors on site with the General Contractor.

1.5 PROJECT CONDITIONS:

A. Coordinate activities with General Contractor.

B. All underground and surface utility lines are to be verified in field.

C. Protect existing trees, plants, lawns and other features designated to part of the landscaping work.

D. Promptly repair damage to adjacent facilities caused by wall construction. Cost of repair shall be at the Contractor’s expense.

E. Promptly notify the Landscape Architect of unexpected sub-surface conditions.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Limestone: to be Michigan dolomitic limestone, supplied by Rockworks, LLC., 1101 Rhodes Road, Lake Orion, Mi 48360. Contact: Ray Rogers, (248) 693-0920, ray@rockworksllc.com

B. Limestone Dimensional Sizes: Sizes, laying patterns, face, ends and top conditions as noted on the plans and details.

C. Non-Woven Filter Fabric: Typar: No. 3401, manufactured by Dupont or approved equal.

D. Drainage Aggregate: 6AA drainage stone.

E. Aggregate Base: 4G crushed aggregate.

PART 3 - EXECUTION

3.1 WALL CONSTRUCTION:

A. Provide and install dry laid walls as shown on drawing(s). Layout and locations are to be approved by Landscape Architect prior to construction. Excess soil excavation material shall be disposed of legally off site and grades left even and without debris. Subgrade shall be compacted to 95% modified proctor and verified through third party testing prior to proceeding. Areas not meeting requirements are to be corrected immediately. Aggregate base course shall be installed in maximum of 6” lifts and compacted to 95% modified proctor and verified through third party testing prior to laying leveling blocks. Areas not meeting requirements shall be corrected immediately.

B. Wall height(s) vary, see plan.

3.2 CLEAN UP:

A. Upon completion of construction, clean areas within contract limits, remove tools and equipment. Site shall be clear, clean and free of debris. Remove excess soil and grade out rough area.

END OF SECTION 323253

SECTION 328400 – IRRIGATION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements and General and Supplemental Requirements, which are hereby made a part of this Section.

1.2 DESCRIPTION OF WORK:

A. Extent of irrigation system work is shown on drawings and by provisions of this Section.

B. The sprinkler system shall be constructed using sprinklers, valves, piping, fittings, controllers, wiring, etc., of size and types as indicated in these specifications. The system shall be constructed to grades and conform to areas and locations as shown on the drawings.

C. Sprinkler lines shown on the drawings are essentially diagrammatic. Spacing of the sprinkler heads or quick coupling valves is shown on the drawings and shall be exceeded only with the permission of the Owner’s authorized representative.

D. Unless otherwise specified or indicated on the drawings, the construction of the sprinkler system shall include the furnishing, installing and testing of all mains, laterals, risers and fittings, sprinkler heads, tap, curbstop, meter, backflow preventer, booster pump, enclosures, quick coupling valves, automatic control valves, manual valves, control timer, weather sensor, flow meters, controller remote operation software, and other necessary specialties and the removal and/or restoration of existing improvements, excavating and backfill, and all other work in accordance with plans and specifications as required for a complete system.

E. The entire system shall conform to local standards and requirements for landscape irrigation systems.

F. The design shall incorporate proven water saving technology.

G. Related Work Specified Elsewhere: Refer to the entire project manual for additional contract requirements.

1.3 SUBMITTALS:

A. Submit specific product information including make and model number to the Landscape Architect on automatic valves, isolation valves, quick coupling valves and swing joint, valve boxes, sprinklers, nozzles, controller, weather sensors, flow meters, two-wire cable, two-wire decoders, wire connectors and single strand wire, all pipe and fittings, clamps, pumps, enclosures, to be used on the project prior to purchasing materials. Submittals are subject to the irrigation consultant’s approval.

B. Submit shop drawing of tap, curbstop, and meter showing approval of City of Northville for the installation per their specifications.

C. Upon irrigation system acceptance, submit written operating and maintenance instructions. Provide format and contents as directed by the Landscape Architect. Include instruction sheets and parts lists for all operating equipment.

D. Provide a reproducible irrigation system record drawing including an electronic copy on a flash drive showing sprinkler heads, valves, field splices, drains and pipelines including quick coupler and automatic valves. Drawing is to be given to the Owner or the Owner’s representative at the

final irrigation system walkthrough. Also include zone chart in each control timer along with colored drawing indicating extent of zones.

1. Legibly mark drawings to record actual construction.
2. Indicate horizontal locations, with a minimum of two dimensions to permanent surface improvements.
3. Identify field changes of dimension and detail and changes made by Change Order.

1.4 QUALITY ASSURANCE:

A. The Contractor shall maintain continuously a competent superintendent, satisfactory to the Owner, with authority to act for him in all matters pertaining to the work.

B. Superintendant shall hold certification as a Certified Irrigation Contractor with the Irrigation Association. Owner’s Representative reserves the right to waive this certification requirement.

C. Contractor shall hold valid licensing in states where irrigation contractors must be licensed to install commercial irrigation systems.

D. The Contractor shall coordinate his work with the other trades.

E. The Contractor shall confine his operations to the area to be improved and to the areas allotted him by the Owner's representative for material and equipment storage.

F. The Contractor shall have a minimum of 5 years experience installing irrigation systems of comparable size and complexity.

G. It shall be the Contractor’s responsibility to ensure and guarantee satisfactory operation of the entire system and the workmanship and restoration of the area. The entire system shall be guaranteed to be complete and perfect in every detail for a period of one year from the date of its acceptance and he hereby agrees to repair or replace any such defects occurring within that year, free of expense to the Owner. Contractor shall winterize the system the first year. Minor maintenance and adjustment shall be by Owner.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Deliver irrigation system components in manufacturer's original undamaged and unopened containers with labels intact and legible.

B. Deliver plastic piping in bundles, packaged to provide adequate protection of pipe ends, both threaded or plain.

C. Store and handle materials to prevent damage and deterioration.

D. Provide secure, locked storage for valves, sprinkler heads and similar components that cannot be immediately replaced, to prevent installation delays.

1.6 PROJECT CONDITIONS:

A. The bidder acknowledges that he has examined the site, plans and specifications, and the submission of a proposal shall be considered evidence that examination has been made.

B. It shall be the contracting installer's responsibility to report to the Owner's authorized representative any deviations between drawings, specifications and the site. Failure to do so prior to the installing of equipment and resulting in replacing and/or relocation equipment shall be done at the Contractor's expense.

C. The exact location of all existing utilities and structures and underground utilities are not indicated on the drawings; their locations shall be determined by the Contractor, and he shall conduct his work so as to prevent interruption of service or damage to them. The Contractor shall protect existing structures and utility services and be responsible for their replacement if damaged by him.

D. Minor adjustments in system layout will be permitted to clear existing fixed obstructions. Final system layout shall be acceptable to Landscape Architect.

1.7 CODES AND STANDARDS:

A. The entire installation shall fully comply with all local and state laws and ordinances and with all established codes applicable thereto.

B. Any permits for the installation of construction of the work included under this contract which are required by any of the legally constituted authorities having jurisdiction, shall be obtained and paid for by the Contractor, each at the proper time. He shall also arrange for and pay all costs in connection with any inspections and examinations required by these authorities.

C. In all cases where inspection of the sprinkler system work is required and/or where portions of the work are specified to be performed under the direction and/or inspection of the Owner's authorized representative, the Contractor shall notify the Owner's authorized representative at least 24 hours in advance of the time and such inspection and/or direction is required.

D. Any necessary re-excavation or alterations to the system needed because of failure of the Contractor to have the required inspections shall be performed at the Contractor's own expense.

1.8 SERVICE AND MAINTENANCE:

A. The Contractor shall service the system at the request during the guarantee period and shall be paid for work performed which is not covered by the guarantee. Contractor shall winterize the system the first year as part of this contract, and will provide written instructions to the Owner for future service and maintenance.

B. Return to the site during the subsequent spring season and demonstrate to the Owner the proper procedures for the system start-up, operation and maintenance.

C. After completion, testing and acceptance of the system, the Contractor will instruct the Owner's personnel in the operation and maintenance of the system.

1.9 OWNER'S ACCEPTANCE:

A. The completion of the contract will be accepted and Notice of Completion recorded only when the entire contract is completed to the satisfaction of the Owner's authorized representative.

B. Within ten (10) days of the Contractor's notification that the installation is complete, the Owner, or his Representative will inspect the installation and if a final acceptance is not given, will prepare a "Punch List" which, upon completion by the Contractor, will signify acceptance by the Owner.

C. Final payment will not be made without the receipt of an accurate as-built drawing by the Landscape Architect.

1.10 WARRANTY:

A. It shall be the Contractor's responsibility to ensure and guarantee satisfactory operation of the entire system and the workmanship and restoration of the area. The entire system shall be

guaranteed to be complete and perfect in every detail for a period of one year from the date of its acceptance and he hereby agrees to repair or replace any such defects occurring within that year, free of expense to the Owner. Minor maintenance and adjustment shall be by Owner.

B. Contractor to guarantee that all trenches and other disturbed areas to be free from heaving or settling more than one-quarter (1/4"). Should it become necessary to adjust the grade, re-grade the trench and re-sod. This no-settlement clause shall extend over the entire period of guarantee of the job.

C. One month prior to the conclusion of the warranty period, the Contractor and Owner's representative shall meet at the site and adjust the zone watering times on the controller to reflect run times for established plant material.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. General:

1. All materials to be incorporated in this system shall be new and without flaws or defect and quality and performance as specified. All material overages at the completion of the installation are the property of the Contractor and are to be removed from the site.
2. The Contractor shall use materials as specified. Material other than specified will be permitted only after written application by the Contractor and written approval by the Landscape Architect. Substitutions will only be allowed when in the best interest of the Owner.

B. Pipe and Fittings:

1. Pipe sizes shall conform to those shown on the drawings. No substitutions of smaller pipe sizes will be permitted, but substitutions of larger size may be approved. All pipe damaged or rejected because of defects shall be removed from the site at the time of said rejection.
2. Provide pipe continuously and permanently marked with manufacturer's name or trademark, size schedule and type of pipe working pressure at 73 degrees F. and National Sanitation Foundation (NSF) approval.
3. All mainline piping and underground piping under continuous pressure plus all pipe 2-1/2" or larger whether a lateral or mainline, shall be rigid, un-plasticized polyvinyl chloride pipe extruded from virgin parent material, ASTM D-2241. Provide pipe homogeneous throughout and free from visible cracks, holes, foreign materials, blisters wrinkles and dents.
4. PVC Pipe and sleeving shall be SDR 21, Class 200 unless stated otherwise on the drawing.
5. PVC Pipe 3" and smaller and all sleeving shall be solvent weld type.
6. PVC pipe fittings for sizes 3" and smaller and all sleeving shall be ASTM D-2466 schedule 40 PVC molded fittings suitable for solvent weld.
7. All threaded PVC pipe-fittings shall be ASTM D-2467, Schedule 80 PVC.
8. Saddle and cross fittings are not permitted. Use male adapters for plastic to metal connections. Hand-tighten male adapters plus one turn with a strap wrench.
9. Polyethylene lateral pipe: All pipe downstream from zone valves sized 2" and smaller, shall be flexible non-toxic polyethylene pipe. Polyethylene pipe shall be PE 3408, ASTM rated at 100 PSI minimum working pressure, and in conformance with ASTM D-2239, NSF approved or as noted on the drawing. Pipe larger than 2" size shall be PSI as specified for mainlines. PE 2306 fittings for polyethylene pipe shall be ASTM D-2609 insert type fittings. Saddle and cross fittings not permitted. All joints shall be secured with stainless steel band and screw clamps.
10. Primer and solvent for use with PVC pipe to conform to ASTM D-2564. Primer to be purple in color. Solvent to be appropriate for pipe and fitting type and weather conditions.
11. All above grade pipe shall be type 'L' copper. Fittings shall be cast brass or wrought copper.

12. Below grade pipe associated with the tap, curbstop, and meter shall be per City specifications.

C. Control System:

1. Controller shall be a Hunter pedestal mount with cellular modem.
2. Controller shall be connected to Hunter Centralus software.
3. Controllers shall be grounded per manufacturer's recommendations.
4. All controllers and sensors shall be acceptable to the local water purveyor for landscape irrigation systems.
5. Include one year of cellular service to support the remote operation of the controller.

D. Control Wire, Decoders, Flow Meters, and Connections:

1. Control wire and two-wire cable shall be Type UL approved, for direct burial and shall be Size 14 or larger, as recommended by the manufacturer for the conditions of the project. Conductor to be single strand soft annealed copper.
2. 24 volt control wires to be red in color. Common wire to be white in color.
3. Two-wire cable shall be manufactured by the controller manufacturer for specific use by that controller.
4. Two-wire decoders shall be manufactured by the controller manufacturer for specific use by that controller.
5. Two-wire cable and decoders shall be grounded per manufacturer's recommendations.
6. Flow meters shall be installed at all watersources. Flow meters shall be manufactured by the controller manufacturer.
7. Low voltage wire connectors to be made using 3M DBY/R-6 connectors.
8. 120 volt or heavier splices made underground to be made using 3M DBY/R-6 connectors.

E. Sprinkler Heads:

1. Sprinkler equipment shall be as noted in the legend.
2. Sprinkler nozzles shall be matched precipitation variety as manufactured by the sprinkler body manufacturer.
3. Rotary sprinklers, ¾" shall be as noted in the legend.
4. Rotary sprinkler nozzles shall be as manufactured for the sprinkler by the sprinkler body manufacturer.

F. Clamps (polyethylene lateral pipe):

1. Clamps to be stainless steel, worm gear hose clamps with stainless steel screw.

G. Automatic Valves and Quick Coupling Valves:

1. Valves shall be as noted in the irrigation legend.
2. Valves shall have zone identification tag attached to the valve stem.
3. Install plastic ball valve upstream of all automatic valves.
4. Quick coupler valves shall be as noted in the legend, 1" size.
5. Quick couplers shall have one piece body with locking lid and stabilized.
6. Quick couplers to be installed on three-elbow pre-fabricated swing joint, with 14" lay length, manufactured by Lasco or Spears

H. Manual Valves

1. Manual valves shall be manufactured by Leemco.
2. Valves 3" and larger shall be gate valves, 200 #WOG, with solid wedge disc, conforming to federal specifications for its class.

3. Valves three inches (3") and larger shall include non-rising stem, with end connections for PVC pipe and have a handle which turns to the left to open.
4. Valves upstream of automatic valves shall be plastic ball valves of the same size as the automatic valve, and be installed in the same valve box as the automatic valve. Manufacturers shall be Lasco or Spears.

I. Valve Boxes:

1. Valve access boxes shall be manufactured by Carson, Pentek, NDS, or Rainbird.
2. Valve Access Boxes to be tapered enclosure of rigid plastic material comprised of fibrous components chemically inert and unaffected by moisture corrosion and temperature changes.
3. Boxes shall have black lid.
4. Boxes to be 11” x 19” and of minimum size required to permit access to the valve. Side walls to extend at least 2" below the bottom of valve body; use extension as necessary.
5. Valve access boxes shall have filter fabric liner and gravel or pea stone sump.

J. Tap, Meter, Cubstop and Backflow Preventer:

1. Watersources for the irrigation systems will be new 2" potable sources.
2. Coordinate with utility contractor and include in the irrigation bid the cost to make a new 2" taps into the watermains. Taps must be in the public road right-of-way or water main easement.
3. Install curbstop box within public road right-of-way or water main easement and continue to meter /backflow/booster pump location with 2" type 'K' copper, 48" bury.
4. Purchase meters from City and install per City of Northville specifications.
5. Backflow preventers shall be RPZ type Febco 825-YA as noted on the watersource detail.
6. Refer to watersource detail and notes regarding installation of watersource components, enclosures, and concrete pad.
7. Direct questions regarding tap, meter, backflow preventer, permitting costs, and installation DPW, City of Northville.

K. Booster Pump:

1. Booster pumps shall be manufactured by Sta rite.
2. Installation shall conform to all applicable electrical codes.
3. Pumps are to start/stop from control timer. Provide pump start relay as required.
4. Booster pumps shall include mercoid switch to suspend pumping operations if upstream pressure drops to 20 PSI.
5. Coordinate with electrician and include in the irrigation bid the cost to wire the pumps and controllers to the 110 volt (for controller) and 208 volt 3 phase power source (for pumps) brought to the watersource location. Include costs to purchase step down transformer, pump starter and pumpstart relay including all costs associated with their installation.

L. Accessories:

1. Drainage fill: 1/2" x 3/4" washed pea gravel.
2. Fill shall be clean soil free of stones larger than 2" diameter, foreign matter, organic material and debris.
3. Provide imported fill material as required to complete the work. Obtain rights and pay all costs for imported materials.
4. Suitable excavated materials removed to accommodate the irrigation system work may be used as fill material subject to the Landscape Architect's review and acceptance.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine final grades and installation conditions. Do not start irrigation system work until unsatisfactory conditions are corrected.

B. Locations of all irrigation system components need to be approved prior to initiating any work. Consult with all trades and individuals to gain approval of positioning of the irrigation components including Owner's Representative, landscape architect, and engineers to ensure that all components are placed in locations where they will operate most efficiently and not be in the way of utilities, plant material and other site components. Any items which are installed and later found to need re-installation because approval was not granted by the knowledgeable party, will be done at the irrigation contractor's expense

C. Set stakes to identify locations of proposed piping and valve boxes. Obtain Owner' Representatives approval before excavation.

D. Obtain latest manufacturer's recommended installation requirements for components. Any deviation between these specifications and plans and those recommendations are to be brought to the attention of the Owner's Representative.

E. Do not willfully install the sprinkler system as shown on the drawings when it is obvious in the field that unknown obstructions, grade differences or differences in the area dimensions exist that might not have been considered in the engineering. Such obstructions or differences should immediately be brought to the attention of the owner's authorized representative. In the event this notification is not performed, the irrigation contractor shall assume full responsibility for any revisions necessary.

F. Tree locations take priority over irrigation piping. Have proposed tree locations stasked by the landscape contractor prior to trenching for pipe. Obtain approval from owner's representative for all pipe routing and valve box locations prior to initiating any work.

3.2 PREPARATION:

A. Layout and stake the location of each pipe run and all sprinkler heads and sprinkler valves for coordination with landscape contractor. Obtain Landscape Architect's acceptance of main line layout prior to excavating, unless specifically waived by the Architect.

3.3 EXCAVATING AND BACKFILLING:

A. Excavating shall be considered unclassified and shall include all materials encountered, except materials that cannot be excavated by normal mechanical means. Excavate trenches of sufficient depth and width to permit proper handling and installation of pipe and fittings. Excavate to depths required to provide 2" depth of earth fill or sand bedding for piping when rock or other unsuitable bearing material is encountered.

B. Install sleeves for irrigation piping prior to paving. Minimum depth of bury for sleeves beneath roadways and drives, 36" and 18" beneath walks.

C. Sleeves needing to be installed beneath existing paving shall be installed by directional bore method. Minimum depth of bury for sleeves beneath roadways and drives, 36" and 18" beneath walks.

D. Pipe pulling will be allowed for lateral pipe only, provided soil moisture content and other conditions are suitable to allow for full depth of bury with a minimum of stretching and scraping of

the pipe. Landscape Architect reserves the right to determine suitability or conditions. If the pulling method is used, the pipe "plow" shall be a vibratory type.

E. Fill to match adjacent grade elevation with approved earth fill material. Place and compact fill in layers not greater than 8" depth.

F. Provide approved fine-grained earth fill or sand to point 4" above the top of pipe, where soil conditions are rocky or otherwise objectionable.

G. Fill to within 6” of final grade with approved excavated or borrow fill materials free of lumps or rocks larger than 2” in any dimension.

H. The top 6” of backfill shall be topsoil, free of rocks, subsoil or trash. Any special soil mixture shall be replaced to the original condition it was prior to irrigation installation.

I. Except as indicated, install irrigation mains with a minimum cover of 24" based on finished grades. Install irrigation laterals with a minimum cover of 14" based on finished grades.

J. Excavate trenches and install piping and backfill during the same working day. Do not leave open trenches or partially filled trenches open overnight.

3.4 UNDERGROUND PIPE:

A. Install plastic pipe in accordance with manufacturer's installation instructions as ASTM D- 2274. Provide for thermal expansion and contraction.

B. Saw cut plastic pipe. Use a square-in-sawing vice, to ensure a square cut. Remove burrs and shavings at cut ends prior to installation.

C. Make PVC plastic-to-plastic joints with solvent weld joints. Use only primer and solvent recommended by the pipe manufacturer. Install plastic fittings in accordance with pipe manufacturer's instructions and ASTM D-2855. Contractor shall make arrangements with pipe manufacturer for all necessary field assistance.

D. Allow joints to set at least 24 hours before pressure is applied to the system.

E. Uncoil poly-pipe and insert fitting full depth. Secure poly-pipe to insert fittings with stainless steel clamps. Double clamp pipe 1-1/2” diameter and larger.

F. Maintain pipe interiors free of dirt and debris. Close open ends of pipe by capping, taping or other acceptable method when pipe installation is not in progress.

G. All mainline and continuously pressurized pipe is to be installed using open trenches. Lateral pipe may be installed by "Plowing" if soil conditions permit, and soils do not contain gravel, rock, construction debris or other potential damaging material.

H. Install thrust blocks on the mainline pipe work in accordance with pipe manufacturer's written instructions.

3.5 SPRINKLER INSTALLATION:

A. Install fittings and sprinkler heads in accordance with manufacturer's instructions, except as otherwise indicated.

B. Set sprinkler heads perpendicular to finished grades, except as otherwise indicated, and position to prevent contact with grounds maintenance equipment. Install sprinklers 6" off walks and curbs.

Locate sprinkler heads to assure proper coverage of indicated sprinkler heads to assure proper coverage if indicated areas. Do not exceed sprinkler head spacing distances indicated in the manufacturer's manual for the nozzles installed and pressure available.

C. Provide pop-up spray heads and rotary sprinklers ¾" IPS or smaller with two elbow poly swing joint riser using "funny pipe", minimum length 12".

3.6 VALVE INSTALLATION:

A. All zone control valves, quick coupler valves, and manual valves shall be enclosed in a minimum 11" x 19" valve box. Add extensions as required to prevent soil settlement around the valve. Set box flush with finish grade and aligned with adjacent boxes and/or adjoining site-work.

B. Install filter fabric inside valve box and install valve boxes on a suitable base of gravel to provide a level foundation at proper grade and to provide drainage of the access box. Support box with block or notch box to protect pipe under box.

C. Provide all quick coupler valves with pre-fabricated three elbow swing joint, schedule 80 PVC.

D. Fittings and pre-fabricated swing joint manufacturers shall be Spears, Lasco, or Dura.

3.7 TAP, CURBSTOP, AND METER

A. All work associated with tap, curbstop, and meter is to be part of the irrigation bid and scope of work.

B. All work shall be per City of Northville specifications and shall meet with approval of the City of Northville DPW prior to system acceptance.

3.8 BACKFLOW PREVENTER:

A. Install backflow preventer per State of Michigan, Oakland County and City of Northville health department requirements.

B. All pipe to and from backflow preventer until the discharge pipe reaches 24" bury, shall be type 'L' hard copper.

C. Backflow preventer to be installed so discharge port is a minimum of 12" above the concrete slab.

3.9 BOOSTER PUMP:

A. Pump to be in end suction, bronze fitted, self-priming, single stage centrifugal type.

B. Pump to be close coupled to a ball bearing, drip proof motor.

C. Pump casing shall be of gray iron, with bronze replaceable wear ring. Impeller to be bronze, provide with mechanical seal.

D. Pump to be mounted on 4" high concrete pad.

E. All pipe to and from pump shall be type 'L' hard copper.

F. Pump is to start/stop from control timer. Provide pump start relay as required.

G. Booster pump shall include mercoid switch to suspend pumping operations if upstream pressure drops to 20 PSI.

H. All electrical work shall conform to current electrical codes. All wire shall be installed in conduit.

3.10 DRAINS:

A. Although it is intended that some systems will be winterized using compressed air. Contractor to install manual drain valves at low points in the system to assist in winterization and service.

3.11 ELECTRICAL AND CONTROLLER INSTALLATION:

A. Install electrical control wire and two-wire cable in the piping trenches wherever possible. Place wire or cable in trench adjacent to or underneath mainlines but not above. Install wire with slack to allow for thermal expansion and contraction. Expansion joints in wire may be provided at 200 foot intervals by making 5-6 turns of the wire around a piece of 1/2" pipe instead of slack. Where necessary to run wire or cable in a separate trench, provide a minimum cover of 24".

B. Provide minimum 24" slack at remote control valves and at all wire splices to allow raising the valve bonnet or splice to the surface without disconnecting the wires for repair.

C. Connect each remote control valve to one station of a controller except as otherwise indicated. Where there is to be more than one valve per station, make required splice at the control timer.

D. Make splices only at valves, unless otherwise unavoidable. Locate all field splices on the as-built drawing.

E. For two-wire systems, ground cable at each valve location and every 500’ or as recommended by the manufacturer and at all two-wire dead-end points.

F. Hard wire 110 volt power to controller. All connections and installations shall meet applicable electrical codes. All wire not buried to be installed in conduit.

G. Install rain sensor in location identified on the plan and per manufacturer’s recommendations.

H. Connect cellular connection to controller and test for successful communication link.

I. Accurately label zones inside the controller. Include color sketch of approximate zone limits.

J. Connect and operate cellular feature with Owner phone to confirm successful valve actuation.

3.12 FLUSHING AND TESTING:

A. After all new sprinkler piping and risers are in place and connected for a given section and all necessary division work has be completed, and prior to the installation of sprinkler heads, all control valves shall be opened and a full head of water used to flush out the system.

B. Sprinkler main shall be tested under normal water pressure for a period of 12 hours. If leaks occur, repair and repeat the test. Give Architect 24 hours notice prior to testing.

C. Testing of the system shall be performed after completion of each section or completion of the entire installation; and any necessary repairs shall be made, at the Contractor's expense, to put the system in good working order before final payment by the Owner.

D. Adjustment of the sprinkler heads and automatic equipment will be done by the Contractor upon completion of installation to provide optimum performance. Minor adjustments during the guarantee period will be made by the Owner.

3.13 CLEAN UP:

A. Contractor shall keep the premises free from rubbish and debris at all times and shall arrange his material storage so as not to interfere with the Owner's operation of the job. Contractor shall remove and legally dispose of all unused material, rubbish and debris, including unsuitable excavated material from the site.

END OF SECTION 328400

SECTION 328410 – SLEEVE INSTALLATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Attention is directed to the Bidding and Contract Requirements and General and Supplemental Requirements, which are hereby made a part of this Section.

1.2 DESCRIPTION OF WORK:

A. Furnish all labor, materials, supplies, equipment, tools, and transportation, and perform all operations in connection with and reasonably incidental to the complete installation of the sleeves as shown on the drawings, the installation details, and as specified herein. The sleeves shall be installed to grades and conform to areas and locations as shown on the drawings. Removal and or restoration of existing improvements, excavation and back-fill, and all other work in accordance with plans and specifications are required.

B. Extent of work is shown on drawings and by provisions of this Section.

C. Items of Work Specifically Included are:

1. Sleeving

D. Related Work Specified Elsewhere: Refer to the entire project manual for additional contract requirements.

1.3 SUBMITTALS:

A. Manufacturer’s Data: Submit manufacturer’s specifications for sleeve piping.

B. Project Record (As-Built) Drawings:

1. Submit record drawings under provisions of Section 017700 – Contract Closeout.
2. Record sleeve locations with accurate reference dimensions measured from at least two permanent reference points.
3. Before construction completion, obtain from the Engineer/Landscape Architect/Owner’s Representative a reproducible Mylar copy of the drawings. Using technical drafting pen or CAD, duplicate information contained on the project drawings maintained on site. Label each sheet “Record Drawings”. Completion of the record drawings will be a prerequisite for the review at the completion of the irrigation system installation.

1.4 QUALITY ASSURANCE:

A. The Contractor shall maintain continuously a competent Superintendent, satisfactory to the Owner, with authority to act for him in all matters pertaining to the work.

B. The Contractor shall coordinate his work with the other trades.

C. The Contractor shall confine work operations to the area to be improved and to the areas allotted to them by the Owner’s Representative for material and equipment storage.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Deliver plastic piping in bundles, packaged to provide adequate protection of pipe ends, either threaded or plain.

B. Store and handle materials to prevent damage and deterioration.

PART 2 - MATERIALS

2.1 GENERAL:

A. Use materials that are new and without flaws or defects of any type, and which are the best of their class and kind. All material overages at the completion of the installation are the property of the Contractor and are to be removed from the site.

2.2 SUBSTITUTIONS:

A. The Contractor shall use materials as specified. Material other than specified will be permitted only after written application by the Contractor and written approval by the Landscape Architect. Substitutions will only be allowed when in the best interest of the Owner.

2.3 SLEEVING:

A. All sleeving material beneath pedestrian and vehicular pavements shall be PVC Class 200 pipe with solvent welded joints.

B. Sleeving beneath drives and streets shall be PVC Class 200 pipe with solvent welded joints.

PART 3 - EXECUTION

3.1 EXCAVATION, TRENCHING, AND BACKFILLING:

A. Excavating shall be considered unclassified and shall include all materials encountered, except materials that cannot be excavated by normal mechanical means.

B. PVC sleeving shall be installed by augering (sidewalks) or directional bore method (drives and roadways).

C. Refer to utility and survey plans and have all utilities marked by utility identification company prior to initiating any sleeve installation.

D. Where utilities conflict with sleeve work, contact the Engineer/Landscape Architect/Owner’s Representative for depth adjustments.

E. Excavate to permit the sleeves to be laid at the intended elevations and to permit work space for installing connections and fittings.

F. Minimum cover-roadways and drives: Maintain a minimum of 30" cover from top of sleeve to finish grade.

G. Minimum cover-sidewalks: Maintain a minimum of 18" cover from top of sleeve to finish grade.

H. Excavated material is generally satisfactory for backfill. Backfill shall be free from rubbish, vegetable matter, and stones larger than 2 inches in maximum dimension. Remove material not suitable for backfill. Backfill placed next to pipe shall be free of sharp objects, which may damage the pipe.

I. Minimum compaction of backfill for sleeves shall be 95% Standard Proctor Density, ASTM D-698-78. Use of water for compaction around sleeve, “puddling,” will not be permitted.

J. Dress backfilled areas to original grade. Incorporate excess backfill into existing site grades.

K. Provide approved fine-grained earth fill or sand to point 4” above the top of pipe, where soil conditions are rocky or otherwise objectionable.

L. Excavate trenches and install piping and backfill during the same working day. Do not leave open trenches or partially filled trenches open overnight.

3.2 SLEEVING AND BORING:

A. Install sleeving at a depth that permits the encased pipe or wiring to remain at the specified burial depth.

B. Extend sleeve ends six inches beyond the edge of the paved surface. Cover pipe ends with duct tape, record locations on as-builts.

3.3 ASSEMBLING PIPE AND FITTING:

A. General:

1. Sleeves may be curved to change direction or avoid obstructions within the limits of the curvature of the pipe as determined by the pipe manfacturer. Minimum radii of curvature are 25 feet for 2-inches diameter pipe and 100 feet for 2½, 3, and 4-inch diameter pipe. All curvature results from the bending of the pipe lengths and 50’ for 6-inch diameter pipe. No deflection will be allowed at a pipe joint.

B. PVC Solvent Weld Pipe:

1. Use a primer and solvent cement. Join pipe in a manner recommended by the manufacturer and in accordance with accepted industry practices.
2. Cure for 30 minutes before handling and 24 hours before allowing water in pipe.
3. Snake pipe from side to side within the trench.

3.4 CLEANUP:

A. Upon completion of work, remove from the site all machinery, tools, excess materials, and rubbish.

END OF SECTION 328410

# SECTION 329119 - TOPSOIL

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, General and Supplemental Requirements, which are hereby made a part of this Section.

### 1.2 DESCRIPTION OF WORK:

A. Extent of Topsoil Work is shown on drawings and by provisions of this Section.

B. Types of work required include the following:

1. Laboratory testing of soil
    a. Imported topsoil
2. Topsoil source (imported)
3. Installation
4. Cleaning

C. Related Work Specified Elsewhere: Refer to the entire project manual for additional contract requirements.

### 1.3 PROJECT CONDITIONS:

A. Known underground and surface utility lines are indicated on the drawings.

B. Protect existing trees, plants, lawns and other features designated to remain as part of the landscaping work.

C. Promptly repair damage to adjacent facilities caused by topsoil operations. Cost of repair shall be at the contractor's expense.

D. Promptly notify the landscape architect of unexpected sub-surface conditions.

### 1.4 QUALITY ASSURANCE:

A. Testing and Inspection: For supplied topsoil. Performed by a qualified independent testing laboratory, under the supervision of a Registered Professional Engineer, specializing in soils engineering.

B. Provide and pay for testing and inspection during topsoil operations. Laboratory shall be acceptable to the landscape architect.

1. Recommended Testing Laboratory:
    A & L Great Lakes Laboratories, Inc.
    3505 Conestoga Drive
    Fort Wayne, IN 46808
    P: (260) 483-4759
    F: (260) 483-5274
    www.algreatlakes.com

1.5 SUBMITTALS:

A. Tests of representative material samples for proposed use shall include:

1. Soil pH and Buffer pH
2. Available phosphorus
3. Mechanical analysis (P.K. Ca. mg) and cation ratios
4. Percentage of organic content and loss by ignition
5. Soil series classification
6. Sand, Silt and Clay content ratios
7. Soluble salts and sodium
8. Cation exchange capacity (CEC)
9. Herbicide multi-residue test (MR-1) required if topsoil from agricultural source
10. Lime/Sulfur requirements

B. Provide soil lab recommendations of fertilizer requirements and ratios for both ornamental plantings and turf lawn.

C. Provide soil lab recommendations on type and quantity of additives required to establish satisfactory pH factor and supply of nutrients to bring soil nutrients to a satisfactory level for ornamental planting and turf lawn.

D. Provide soil lab recommendations regarding residue test results if applicable.

E. Submit test reports in a timely manner so that topsoil testing results are approved prior to beginning topsoiling work.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Topsoil: Imported topsoil proposed for use must meet testing criteria results specified and conform to adjustments as recommended by soil test and landscape architect.

B. Provide lightly screened topsoil as required to complete the job. Topsoil should not be screened to the effect that the end product has a fine particle composition and is highly compactable. All processing, cleaning and preparation of topsoil to render it acceptable for use is the responsibility of this contractor.

C. Imported topsoil shall be fertile, friable and representative of local productive soil, capable of sustaining vigorous plant growth and lightly screened free of clay lumps, subsoil, noxious seeds, weeds or other foreign matter such as stones, roots, sticks and other extraneous materials greater than 1" in diameter in any dimension and shall not be frozen or muddy.

1. Supplied topsoil **for all seeded lawn, meadow lawn, and plant mixes** shall have the following charicteristics:
   a. pH shall range between 5.0 and 7.5.
   b. Organic matter shall range between 3 and 10 percent.
   c. Soluable salts shall be less than 1.6 mmho/cm.
   d. Sand content shall range between 65 and 75 percent.
   e. Silt content shall range between 10 and 20 percent.
   f. Clay content as determined by Bouyoucous Hydrometer Test shall range between 5 and 15 percent.
   g. CEC should range between 5 and 12.
   h. The topsoil shall be classified as a sandy loam topsoil.

2. Supplied topsoil **for all plug planting areas** shall have the following charicteristics:
   a. pH shall range between 5.0 and 7.5.
   b. Organic matter shall range between 3 and 10 percent.
   c. Soluable salts shall be less than 1.6 mmho/cm.
   d. Sand content shall range between 70 and 90 percent.
   e. Silt content shall range between 0 and 30 percent.
   f. Clay content as determined by Bouyoucous Hydrometer Test shall range between 10 and 15 percent.
   g. CEC should range between 5 and 12.
   h. The topsoil shall be classified as a loamy sand topsoil.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine rough grades and installation conditions. Do not start topsoil work until unsatisfactory conditions are corrected.

3.2 INSTALLATION:

A. Perform topsoiling within contract limits, including adjacent transition areas, to new elevations, levels, profiles, and contours indicated. Provide uniform levels and slopes between new elevations and existing grades.

B. Grade surfaces to assure areas drain away from building structures and to prevent ponding and pockets of surface drainage.

C. Lawn Areas: Supply and spread topsoil to a minimum uniform depth of 4” or as noted. Remove clumps larger than 1” in diameter.

D. Grade lawn areas to a smooth, free draining even surface with a loose, moderately coarse texture ready to accept seed or sod.

E. For trees, shrubs, ground cover beds and backfill for beds see Section 329300 – Plants.

F. Plug Planting Areas: Supply and spread topsoil to a minimum uniform depth of 8” or as noted. Remove clumps larger than 1” in diameter.

G. Provide earth crowning where indicated on drawings.

H. Crowning/mounding to be free flowing in shape and design, as indicated, and to blend into existing grades gradually so that toe of slope is not readily visible. Landscape architect to verify final contouring before planting.

I. Regardless of finish grading elevations indicated, it is intended that grading be such that proper drainage of surface water will occur and that no low areas are created to allow ponding. contractor to consult with owner or landscape architect regarding minor variations in grade elevations before rough grading is completed.

J. Fine Grading of topsoiled areas shall comply to the specifications of this section as well as Section 312216 – Fine Grading.

K. Landscape areas to receive topsoil should not be compacted more than 80%-85%.

3.3 CLEANING:

A. Upon completion of topsoiling operations, clean areas within contract limits, remove tools and equipment. Site shall be clear, clean, free of debris and suitable for site work operations.

END OF SECTION 329119

# SECTION 329216.13 – PRAIRIE GRASS PLANTING – PLUG METHOD

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and to General and Supplemental Requirements, which are hereby made a part of this Section.

### 1.2 DESCRIPTION OF WORK:

A. Extent of prairie grass plug planting is shown on drawings and by provision of this Section.

### 1.3 SUBMITTALS:

A. Submit vendor's certification of specified prairie grass, indicating percentage by weight and percentages of purity, germination and weed seed for each seed.

### 1.4 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials in original undamaged containers. Store in a manner to prevent wetting and deterioration.

### 1.5 PROJECT CONDITIONS:

A. Work Notification: Notify Landscape Architect at least 7 working days prior to start of seeding operation.

B. Protect existing utilities, paving and other facilities from damage caused by seeding operations.

C. Perform installation work only after other work affecting ground surface has been completed.

D. Provide hose and lawn watering equipment as required. Refer to Irrigation plan.

### 1.6 WARRANTY:

A. Refer to Section 320536 – Landscape Maintenance and Warranty Standards.

## PART 2 - PRODUCTS

### 2.1 MATERIALS:

A. Prairie Grass Seed: Fresh, clean and new crop seed mixture. Seed shall not be mixed together but packaged individually according to species.

1. The Contractor is to obtain a source and coordinate for plug development in conjunction with planting schedule.

B. Plug sources as follows or as approved:

1. Little Bluestem (straight variety) Contact/Supplier: Stantec Nursery
   Attn: Jason Fritz, (574) 586-2412, jason.fritz@stantec.com

2. Little Bluestem 'The Blues' Suppliers:
   a. Twixwood Nursery, Berrien Springs, MI
   b. Green Glen Nursery, Elwood, IL
   c. Klyn Nursery, Perry, OH

d. Goodmark Nursery, Wonder Lake, IL

C. Herbicides: The Contractor shall possess a valid Michigan Department of Agricultural commercial pesticide applicator's certificate.

D. Water: Free of substances harmful to seed growth. Hoses or other methods of transportation furnished by Contractor.

PART 3 - EXECUTION

3.1 PREPARATION OF PRAIRIE GRASS AREAS:

A. Landscape Architect must approve finish surfaces, grades, topsoil quality and depth. Do not start planting until unsatisfactory conditions are corrected.

B. Place and spread topsoil as indicated on the drawings and specs. Grade areas to a loose moderately course texture utilizing york rake/box blade or similar equipment, soil should be scarified to a depth of at least 3". Rake and remove ridges and fill depressions as required, utilize a "Rock Picker" and remove all stones over ½" diameter. Fine grade and slope to ensure positive drainage.

C. Between September 24 and October 7, treat lawn areas as required with approved herbicide at label rate application to kill all existing planting cover within specified planting zones to ensure a weed free planting base. Re-apply as necessary targeting any remaining green vegetation.

D. Fertilizer shall not be used within prairie grass area. Care shall be taken not to extend fertilization from other areas into the prairie grass areas.

E. Restore areas to specified conditions if eroded, settled or otherwise disturbed after fine grading and prior to planting.

F. Landscape Architect shall review and approve bed preparation prior to seeding operation.

3.2 INSTALLATION:

A. Installation:

1. Plant immediately after preparation of bed.
2. Plant prairie grass areas only between September 1 and October 1 or at such other times acceptable to Landscape Architect.
3. Install plugs into topsoil in an even grid each way at 12" o.c.
4. Provide 2" depth layer of double processed shredded bark mulch in between all grasses.

3.3 MAINTENANCE:

A. Refer to Section 320190 - Landscape Maintenance and Warranty Standards for detailed instructions/requirements.

B. Establish dense planting of prairie grass. Any area failing to show uniform growth shall be replanted; continue until dense planting is established. Damage to area resulting from erosion to be repaired by Contractor. Bare spots over 5 percent of total area shall be replanted.

3.4 CLEANING:

A. Perform cleaning during installation of the work and upon completion of the work to the approval of the Landscape Architect. Remove from site all excess materials, debris and equipment. Repair damage resulting from planting operations.

END OF SECTION 329216.13

# SECTION 329219 - SEEDING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and to General and Supplemental Requirements, which are hereby made a part of this Section.

### 1.2 DESCRIPTION OF WORK:

A. Extent of seeded lawns is shown on drawings and by provision of this section.

B. Type of work required includes the following:

1. Soil preparation
2. Seed Installation
3. Hydromulching
4. Erosion straw blankets (as required)
5. Establishment
6. Cleaning

C. Related work specified elsewhere: Refer to the entire project manual for additional contract requirements.

### 1.3 SUBMITTALS:

A. Seed vendor's certification for required grass seed mixture, indicating percentage by weight and percentages of purity, germination and weed seed for each grass species.

B. Erosion control blanket manufacturer data sheets, including anchoring.

C. Fertilizer manufacturer data sheets.

D. Hydromulching manufacturer data sheets.

### 1.4 DELIVERY, STORAGE AND HANDLING:

A. Deliver seed and fertilizer materials in original unopened containers, showing weight, analysis and name of manufacturer. Store in a manner to prevent wetting and deterioration.

### 1.5 PROJECT CONDITIONS:

A. General:

1. The contractor shall examine and verify the acceptability of the job site. Notify landscape architect if conditions detrimental to plant growth are encountered such as rubble fill, adverse drainage conditions or obstructions. Do not proceed with the work until unsatisfactory conditions have been corrected or resolved in writing by the landscape architect.
2. Where seeding occurs in close proximity to other site improvements or areas to remain undisturbed such as existing wetlands and upland areas care shall be taken to not disturb the existing conditions. Any areas damaged during planting operations shall be promptly restored to their original condition at no cost to the owner.
3. Work Notification: Notify landscape architect at least 7 working days prior to start of seeding operation.

4. Protect existing utilities, paving and other facilities from damage caused by seeding operations.
5. Perform seeding work only after planting and other work affecting ground surface has been completed.
6. Restrict traffic from lawn areas until grass is established. Erect signs and barriers as required.
7. Provide hose and lawn watering equipment as required for germination and establishment.
8. If an irrigation system is to be installed per the contract drawings, it shall be installed prior to seeding. Locate, protect and maintain the irrigation system during seeding operations. Repair irrigation system components damaged during seeding operations at this contractor's expense.

1.6 WARRANTY:

A. Refer to Section 320536 – Landscape Maintenance and Warranty Standards.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Topsoil for seeded lawn areas: Refer to Section 329119 – Topsoil, and to drawings.

B. Seed: Fresh, clean and new crop seed mixture. Mixed by approved methods.

C. Composed of the following varieties, mixed to the specified proportions by weight and tested to minimum percentages of purity and germination.

D. Jacklin seed products manufactured by Simplot. www.simplot.com, distributed by Harrell's. www.harrells.com

E. Seed Mixture: Proportioned by weight as indicated below:

| ***LAWNS*** | Proportion | Minimum Purity | Minimum Germination |
|---|---|---|---|
| Harrells Elite Sunny Mix (Lawns only) | | | |
| Revenge, Accent II Per. Ryegrass | 35% | 95% | 80% |
| Aruba creeping red fescue | 35% | 95% | 80% |
| Bluechip Plus, NuBlue Plus Ky. Bluegrass | 30% | 95% | 80% |

Seeding rate of 4-5 lbs./1,000 sf

| ***MEADOW LAWN (FINE FESCUE) SEED MIX:*** | Proportion | Minimum Purity | Minimum Germination |
|---|---|---|---|
| (NO MOW LAWN proprietary mix without Rye available through Prairie Nursery www.prairienursery.com or approved equal) | | | |
| Hard Fescue – 2 varieties | | 98% | 85% |
| Sheep Fescue | | 98% | 85% |
| Chewings Fescue | | 98% | 85% |
| Red Fescue | | 98% | 85% |
| Creeping Red Fescue | | 98% | 85% |

Seeding rate at 5lbs/1,000 sf, including on slopes

No noxious weed seeds permitted.

F. Fertilizer: Use a 1-2-1 NPK ratio SGN 100-210 starter fertilizer that is non injurious to turf seedlings with a controlled release of nitrogen to provide 10-16 week of fertility for optimum turf growth. Nitrogen not to be affected by rainfall or irrigation. Phosphorus and potassium amendments shall be industry standards. If soil test results show adequate phosphorus and potassium then NPK ration shall be amended to 3-0-2 (see 3.2F for application rates)

G. Ground limestone: Used if required by soil test report. Containing not less than 85% of total carbonates and ground to such fineness that 50% will pass through a 100 mesh sieve and 90% will pass through a 20% mesh sieve.

H. Granulated sulfur 0-0-0-90 to lower PH. Use if determined by soil tests to be necessary. Apply per soil test recommendations at specified rate.

I. Water: Free of substance harmful to seed growth. Hoses or other methods of transportation furnished by contractor. Test for excess Alkalinity, if necessary.

J. Hydromulch: Degradable green dyed wood cellulose fiber or 100% recycled long fiber pulp, free from weeds or other foreign matter toxic to seed germination, water and wildlife and suitable to hydromulching.

1. Available manufacturer and product, or approved equal:
   a. Profile Products LLC, Buffalo Grove, IL
      1) Profile HM Wood w/ Tack for slopes less than or equal to 3H:1V
      2) ProMatrix EFM/BFM for slopes less than or equal to 2H:1V
      3) Flexterra HP-FGM for slopes less than or equal to 0.25H:1V

K. Biodegradable erosion control blanket: 100% organic, weed seed free fibers, single stitched into a photodegradable white netting. Acceptable manufacturer: American Excelsior – Curlex I or approved substitute.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Landscape architect or owner’s representative must approve finish surfaces, grades, topsoil quality and depth. Do not start seeding work until unsatisfactory conditions are corrected.

3.2 PREPARATION OF SEEDED LAWN AREAS:

A. Limit preparation to areas which will be immediately seeded.

B. Treat lawn areas if required with "Round Up" by Monsanto, per label directions to kill existing vegetation prior to seeding.

C. Loosen topsoil of lawn areas to minimum depth of 4". Remove stones over 1" in any dimension and sticks, roots, rubbish and extraneous matter. (In athletic fields remove stones over 1/4” in any dimension. Refer to Section 329119 – Topsoil.)

D. Apply amendments as indicated by soil test and incorporate in top 3 inches of soil. Amended soil test results must be forwarded to landscape architect or owner’s representative.

E. Grade lawn areas to a smooth, free draining even surface with a loose, moderately coarse texture. Roll and rake, remove ridges and fill depressions as required to drain.

F. Apply starter fertilizer (meadow lawn area shall only receive fertilizer per supplier and soil test) at a rate to provide sustained fertility to seedlings of .15 - .2 lbs. N per 1,000 sf per week for 10-

16 weeks or per topsoil test recommendations. Starter fertilizer may be part of phosphorus and potassium needs as indicated by soil test.

G. Apply fertilizers, thoroughly and evenly incorporated into soil to a minimum depth of 1/4" by dragging or other approved method. Fertilize areas inaccessible to power equipment with hand tools and incorporate into soil.

H. Restore prepared areas to specified condition if eroded, settled or otherwise disturbed after fine grading and prior to seeding.

3.3 INSTALLATION:

A. Seed lawns only between April 1 and June 1 (Meadow lawn between March 15 and May 15) and fall seeding between August 15 and October 15 or at such other times acceptable to landscape architect.

B. Seed immediately after preparation of soil bed. Seed indicated areas within contract limits and turf areas adjoining contract limits disturbed as a result of construction operations.

C. Perform seeding operations when the soil is dry and when winds do not exceed 5 miles per hour velocity.

D. Apply seed at a rate per seed mixture specifications. Install seed evenly by sowing equal quantities in 2 directions, at right angles to each other, to achieve 100% uniform coverage.

E. After seeding, rake or drag surface of soil lightly to incorporate seed into top 1/8" of soil. Roll with light lawn roller.

F. Acceptable means of seed distribution include rotary spreader or pull behind mechanical spreaders with cultipacker. Unless specifically noted, hydroseeding is not allowed.

3.4 HYDROMULCHING:

A. Use a hydromulcher (sprayer) and apply mixture(s) per manufacturers recommended application rates. Mix in accordance with manufacturer's recommendations.

B. Use tackifier on all erosion prone areas: steep slopes, high wind areas, drainage areas.

C. Care must be taken not to get hydromulch materials on buildings, walks, roadways, plant beds etc.

3.5 EROSION BLANKET:

A. On slopes exceeding 3H: 1V, or as shown on drawing, install erosion control blanket per manufacturer’s guidelines if not using approved hydromulch for slopes.

3.6 LAWN ESTABLISHMENT:

A. Establish dense lawn of permanent grasses, free from weeds, lumps and depressions. Any area failing to show uniform germination to be reseeded; continue until dense lawn established. If seeded in fall or if not considered acceptable at that time, continue maintenance the following spring until acceptable lawn is established. Damage to seeded area resulting from erosion to be repaired by contractor. Scattered bare spots over 5 percent are not allowed or bare spots larger than a 3” x 3” area.

B. In event contractor does not establish dense lawn during germination period, return to project to re-fertilize and reseed to establish dense lawn.

C. The contractor shall provide a minimum of two cuttings for acceptance of the lawn, or more as necessary until the inspection and acceptance of installation by the owner's representative and landscape architect. When the seeded turf lawn reaches 4" in height it shall be cut to 3" in height. Not more than 1/3 of the grass leaf shall be removed at any single mowing. Meadow lawn shall have seed heads cut in June and be maintained at a height of 8"-10".

D. Should the seeded lawn become largely weeds after germination, contractor shall be responsible to kill the weeds and reseed the proposed lawn areas to produce a dense turf, as specified at no additional cost.

3.7 MAINTENANCE:

A. Refer to section 320536 - Landscape Maintenance and Warranty Standards for additional contract requirements.

3.8 CLEANING, REMOVAL AND RESTORATION:

A. All areas over which hauling operations have been conducted shall be kept clean on a daily basis. Promptly remove materials spilled on pavement.

B. Upon completion of seed installation, remove from the site and legally dispose of all trash and debris including any material removed during grade preparation.

C. Restore existing areas damaged by operations under the contract. Restoration shall include finish grading and seeding as required to match existing grade and/or wetlands, and maintenance of restored areas.

D. Any damage by the contractor to established or newly seeded areas not within the project scope of work shall be repaired and reseeded at no cost to the owner.

E. Repair damage resulting from seeding operations. Clean all areas where overspray has occurred from hydromulching operations.

END OF SECTION 329219

SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and to General and Supplemental Conditions hereby made a part of this Section.

1.2 DESCRIPTION OF WORK:

A. Extent of trees, shrubs and ground covers is shown on Sheets L300 and L301 and by provisions of this Section.

B. Type of Work Required Includes the Following:

1. Planting backfill tests
2. Compost tests
3. Soil percolation, moisture, and soil compaction testing
4. Soil preparation
5. Planting mixes
6. Plant materials
7. Plant material installation
8. Backfill and planting accessories, watering, mulching, staking/guying
9. Pruning
10. Cleaning
11. Maintenance and Warranty

C. Related Work Specified Elsewhere: Refer to the entire project manual for additional contract requirements.

1.3 SUBMITTALS:

A. See the contract General Conditions for policy and procedures related to submittals.

B. Submit all product submittals immediately after contract award.

C. Product data and certificates: For each type of manufactured product, submit data and certificates that the product meets the specification requirements, and complying with the following:

1. Submit manufacturers or supplier’s product data and literature certified analysis for standard products and bulk materials, complying with testing requirements and referenced standards and specific requested testing.

a. For Compost product submit the following analysis by a recognized laboratory:

1.) pH
2.) Salt concentration (electrical conductivity)
3.) Moisture content %, wet weight basis
4.) Particle size % passing a selected mesh size, dry weight basis
5.) Stability carbon dioxide evolution rate mg CO2-C per g OM per day
6.) Solvita maturity test
7.) Physical contaminants (inerts) %, dry weight basis
8.) US EPA Class A standard, 40CFR § 503.13, Tables 1 and 3 levels Chemical Contaminants mg/kg (ppm)

b. For imported topsoil; refer to Specification Section 329119: Topsoil.

c. For planting backfill mix type ‘A’, submit the following analysis by a recognized laboratory:

1.) pH factor
2.) Mechanical analysis (P, K, Ca, Mg) and Cation ratios
3.) Percentage of organic content and loss by ignition
4.) Fertilizer recommendation for ornamental plants based on laboratory analysis

d. If tests fail to meet the specifications, obtain other sources of material, or amend and retest and resubmit until accepted by the owner’s representative.

e. All soil testing will be at the expense of the contractor.

f. Submit materials certification for all fertilizer products as recommended by the soil tests.

g. Submit product data sheets for all planting accessories proposed to be used.

D. Submit labeled samples of the following:

1. One (1) quart bag of double processed shredded bark mulch.
2. One (1) quart bag of planting backfill mix Type A.

E. Plants must be approved by 1 of 2 options at the discretion of the landscape architect:

1. Landscape architect field tag.
2. Photographs of representative material. Each submitted image shall have a height and width reference, such as a measuring stick or ruler and shall have dimensions visible in the photos. Plants not meeting the quality of approved representative sample will be rejected.

F. Submit planting pit percolation results.

1.4 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. Take all precautions customary in good trade practice in preparing plants for moving. Workmanship that fails to meet the highest standards will be rejected.Transport and handle plants with care to ensure protection against injury. Inspection certificates required by law shall accompany each shipment invoice or order to stock and on arrival. A copy of certificate shall be filed with the owner’s representative. Protect all plants from drying out. If plants cannot be planted immediately upon delivery, properly protect them with soil, wet peat moss or in a manner acceptable to the landscape architect. Contractor to confirm root ball moisture levels are acceptable with moisture meter. Refer to Section 3.3.D.3. Water heeled-in plantings as required to keep root system moist until planting. No plant shall be bound with rope or wire in a manner that could damage or break the branches.

C. Cover plants transported on open vehicles with a protective covering to prevent windburn.

D. Frozen or muddy backfill mixture is not acceptable.

1.5 PROJECT CONDITIONS:

A. Work Notification: Notify landscape architect at least 10 working days prior to installation of plant material.

B. Protect existing utilities, paving and other facilities from damage caused by landscaping operations. Contractor to contact Miss Dig prior to any digging operations. See AIA General Conditions.

C. A complete list of plants, including a schedule of sizes, quantities and other requirements is shown on the contract documents. In the event that quantity discrepancies or material omissions occur in the proposal form, contractor shall notify the landscape architect during the proposal bidding process.

D. It is the responsibility of the contractor to be familiar with the local growing conditions. If any specified plants will be in conflict with these conditions, report any potential conflicts, in writing, to the owner's representative.

E. If an irrigation system is to be installed per the contract drawings, it shall be installed prior to planting. Locate, protect and maintain the irrigation system during planting operations. Repair irrigation system components damaged during planting operations, at this contractor's expense.

F. Verify availability of on-site water.

G. Concealed contingencies. Refer to AIA General Conditions.

H. Maintain grade stakes set by others until parties affected mutually agree upon removal.

I. Repair all damage caused by planting operations.

1.6 QUALITY ASSURANCE:

A. The contractor shall provide soil tests for a clear understanding of soil conditions and inform fertilizer recommendations for proposed planting as outlined in Section 329119 - Topsoil.

B. Planting shall be performed only by experienced workers familiar with planting procedures and under the supervision of a qualified supervisor.

C. Plant names indicated; comply with "Standardized Plant Names" as adopted by the latest edition of the American Joint Committee of Horticultural Nomenclature. Names of varieties not listed conform generally with names accepted by the nursery trade. Provide stock true to botanical name and legibly tagged.

D. Comply with root ball sizing and grading standards of the latest edition of "American Standard for Nursery Stock." A plant shall be dimensioned as it stands in its natural position.

E. All plants shall come from nurseries located in Zones 3 – 6A of the USDA Hardiness Zone Map unless approved by the landscape architect.

F. Such approval shall not impair the right of inspection and rejection upon delivery at the site or during the progress of the work.

G. Pruning practices shall conform to recommendations "Structural Pruning: A Guide For The Green Industry" most current edition; published by Urban Tree Foundation, Visalia, California.

1.7 PERMITS AND REGULATIONS

A. The contractor shall obtain and pay for all permits related to this section of the work unless previously excluded under provision of the contract or general conditions. The contractor shall comply with all laws and ordinances bearing on the operation or conduct of the work as drawn and specified. If the contractor observes that a conflict exists between permit requirements and

the work outlined in the contract documents, the contractor shall promptly notify the owner's representative in writing including a description of any necessary changes and changes to the contract price resulting from changes in the work.

B. Wherever references are made to standards or codes in accordance with which work is to be performed or tested, the edition or revision of the standards and codes current on the effective date of this contract shall apply, unless otherwise expressly set forth.

C. In case of conflict among any referenced standards or codes or between any referenced standards and codes and the specifications, the more restrictive standard shall apply or owner's representative shall determine which shall govern.

1.8 MAINTENANCE AND WARRANTY:

A. Refer to Section 320536 – Landscape Maintenance and Warranty Standards.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Plants - General: Provide plants typical of their species or variety; with densely developed branches and vigorous, fibrous root systems free of insects and diseases and have a fully developed form without voids and open spaces. Plants shall be lush, without dry foliage or root balls, free of defects, disfiguring knots, sunscald, wind burn, broken branches, frost cracks or abrasions.

1. All plants shall meet the requirements for caliper, spread and height indicated on the contract drawings or within the project manual. Plants larger than those specified may be used if acceptable to landscape architect.
2. Balled and burlapped plants shall have clay, clay loam, or sandy loam balls of sufficient diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant. Beach sand or loose sand root balls are not acceptable. Root balls which crumble or do not hold together on their own when burlap is pulled down will be rejected.
3. Provide root ball sizes complying with the latest edition of the "American Standard for Nursery Stock" latest edition.
4. Cracked or mushroomed balls will not be accepted.
5. No pruning wounds shall be present with a diameter of more than 1" and all pruning wounds must show vigorous bark on all edges.
6. Plants shall not have root bound, circular or girdled root systems.

B. All trees shall have straight trunks and crowns of healthy condition as follows:

1. Trees must have one straight central leader through crown of tree, unless a different form is inherent in that species and is approved by landscape architect during the submittal process.
2. "V" crotch branching will not be accepted.
3. Tree crown shall be uniform, full without "holes" or missing branch structure, symmetrical, plumb and characteristic of species.
4. Evergreen trees shall be considered either natural or lightly sheared, fully branched to ground and shall have a shearing designation Type 'N' or 'LS' as set forth in the "American Standard for Nursery Stock" latest edition.
5. The tree trunk shall be straight, vertical, and free of wounds that penetrate to the wood with properly made cuts. Sunburned areas, conks (fungal fruiting bodies), wood cracks, sap leakage, signs of boring insects, galls, cankers, girdling ties, or lesions (mechanical injury) are not acceptable and are cause for rejection.

C. Specimen Stock: All specimen designated plantings are to be nursery grown, fully developed, meeting or exceeding specified size and associated root ball sizes per the “American Standard for Nursery Stock” latest edition, exceed quality standards set forth above, and be of excellent quality and exceptional examples of the species. Plants designated to be planted in rows must be matched, symmetrical and uniform in height, spread, caliper, branching height and crown density.

1. Matched plantings shall be obtained from same nursery and, preferably, from same row or line.
2. Landscape contractor to tag specimen trees or shrubs at the source of supply. The landscape architect may inspect specimen selections at the source of supply for suitability and adaptability to selected location. When specimen plants cannot be purchased locally, contractor shall provide sufficient photographs of the proposed specimen plants for approval. The landscape contractor shall inspect all plant material at source prior to landscape architect's review. Landscape contractor shall accompany landscape architect to nursery on final selection trip (if required).

D. Container-Grown Stock: Grown in a container for sufficient length of time for the root system to have developed to hold its soil together, firm and whole.

1. No plants shall be loose in the container.
2. Container stock shall not be root bound.
3. The measurements for height shall be taken from the ground level to the average height of the top of the plant and not the longest branch as per the American Standard for Nursery Stock.
4. Single stemmed or thin plants will not be accepted.
5. Side branches shall be generous, well twigged and the plant as a whole shall be well branched to the ground.
6. Plants shall be in a moist, vigorous condition, free from dead wood, bruises or other root or branch injuries.

E. Topsoil for Planting Mix: Refer to Section 329119 - Topsoil.

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

1. Compost shall be commercially prepared Compost and meet US Compost Council STA/TMECC criteria or as modified in this section for “Compost as a Landscape Backfill Mix Component”.

    a. http://compostingcouncil.org/admin/wp-content/plugins/wp-pdfupload/pdf/191/LandscapeArch_Specs.pdf

2. Compost shall comply with the following parameters:

    a. pH: 5.5 - 8.0.
    b. Soil salt (electrical conductivity): maximum 5 dS/m (mmhos/cm).
    c. Moisture content %, wet weight basis: 30 – 60.
    d. Particle size, dry weight basis: 98% pass through 3/4 inch screen or smear.
    e. Stability carbon dioxide evolution rate: mg CO2-C/ g OM/ day < 2.
    f. Solvita maturity test: > 6.
    g. Physical contaminants (inerts), %, dry weight basis: <1%.
    h. Chemical contaminants, mg/kg (ppm): meet or exceed US EPA Class A standard, 40CFR § 503.13, Tables 1 and 3 levels.

i. Biological contaminants select pathogens fecal coliform bacteria, or salmonella, meet or exceed US EPA Class A standard, 40 CFR § 503.32(a) level requirements.

G. Planting Mixture Type A: (for shrubs, perennials, ground covers and trees within plant beds at grade) Planting backfill shall be a mixture of 3/4 topsoil, 1/4 compost. Mix together to loosely incorporate compost into topsoil. Ensure not to over mix and do not mix with a mechanical soil blending machine. Mix by hand shovel or loader bucket. Do not screen the backfill mixture. Add fertilizer only if required and at rates indicated by soil tests. Fertilizer can be mixed into backfill or broadcast on top after installation. Follow planting details and provisions of this specification for installation instructions.

1. Planting Mix Type A shall comply with the following parameters:

a. pH: 5.5 - 7.0
b. Percentage of organic content and loss by ignition: 2.75 - 4% (by dry weight)
c. Soil chemistry suitable for growing the plants specified

H. Planting Mixture Type B: (for trees in individual planting pits at grade) Planting backfill shall be a profile of 1/3 existing soil excavated from tree pit, 2/3 approved topsoil. Repurposed existing soil shall not contain clumps of organic material from existing finish grade (i.e. lawn / plants / roots). Add fertilizer only if required, at rates indicated by soil tests and at the direction of the landscape architect. Follow planting details and provisions of this specification for installation instructions.

I. Plant fertilizer with micronutrients shall be applied only per soil test recommendations, at the direction of the landscape architect or owner’s representative, and shall be:

1. Legal and acceptable in the local community of the project and shall not be harmful to the public or wildlife when applied per manufacturer’s instructions.
2. Controlled-release, SCU or IBDU fertilizers for plant beds and deep-root feeding shall be used unless approved otherwise.
3. Tree and plant fertilizer used shall contain low or no phosphate unless soil tests indicate soil is deficient in this nutrient.

J. “MyCor” PHC Tree Saver Soil Conditioner manufactured by Plant Health Care, Inc., (800) 421-9051. Shall be applied only if indicated on soil test recommendations or if instructed by landscape architect or owner’s representative.

K. Elemental Sulfur: Use to lower soil pH only under the direction of the landscape architect or based upon the soil test report.

L. Lime:

1. Use to increase soil pH only, under direction of landscape architect or based upon soil test report.
2. ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:

a. Class: Class T, with a minimum 99 percent passing through No. 8 (2.36-mm) sieve and a minimum 75 percent passing through No. 60 (0.25-mm) sieve.
b. Provide lime in form of dolomitic limestone.

3. Provide manufacturer’s literature and material certification that the product meets the requirements.

M. Anti-Dessicant: Protective natural polymer film emulsion providing a protective film over plant surfaces; permeable to permit transpiration. Mixed and applied in accordance with

manufacturer's instructions.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

    a. Bonide: Wilt Stop
    b. SavATree: ArborGuard
    c. Wilt Pruf

N. Double Processed Shredded Bark Mulch: Dark brown in color, clean, free of debris and sticks, and well aerated. Materials shall be uniform in size, shape and texture. Recycled wood products, such as “pallet mulch,” shall not be used. Submit samples for approval prior to installation.

O. Water: Free of substances harmful to plant growth. Hoses or other methods of transportation furnished by contractor.

P. Stakes for Staking: Untreated hardwood, 2" x 2" x 6'-0" minimum length.

Q. Stakes for Guying: Untreated hardwood, 2 x 4 nominal, x 24” length, pointed on one end.

R. Guying/Staking Fabric: Polypropylene (ArborTie Green), available from www.deeproot.com.

S. Tree Wrap: Commercial grade, light colored, 3” wide, biodegradable, waterproof with ability to stretch to conform to surfaces.

T. Twine: Two-ply biodegradable jute material.

U. Pre-Emergent: Extended Control Weed Preventer manufactured by Preen.

V. Steel Edging: Steel edging 1/8-inch- (3.2-mm-) thick by 4-inch- (100-mm-) high with loops pressed from or welded to face to receive 12” long steel stakes.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

    a. Border Concepts, Inc.
    b. Collier Metal Specialties, Inc.
    c. J. D. Russell Company
    d. Ryerson, J. T. & Son, Inc.
    e. Sure-Loc Edging Corporation

2. Color and Finish: Black
3. Install per manufacturer’s recommendations. Top to be flush with finish grade, alignment per drawings. All edging to be new.

## PART 3 - EXECUTION

### 3.1 EXAMINATION:

A. Examine proposed planting areas and conditions of areas for installation. Do not start planting work until unsatisfactory conditions are corrected.

B. Provide percolation testing by filling 12” dia x 12” depth plant pits with water, refilling pit after all water has drained and monitoring length of time for water to completely percolate into soil. If pits do not drain at 1” per hour minimum or drain faster than 3” per hour, notify owner’s representative with recommendations for remedy.

C. Verify soil compaction in all planting areas and ensure compaction does not exceed 80%-85% modified proctor.

3.2 PREPARATION:

A. Time of Tree Digging:

1. Evergreen Material: Dig evergreen materials between August 15 and October 1 or in spring before new growth emerges. If project requirements require digging at other times, plants shall be watered to saturate the root balls and sprayed with anti-desiccant prior to digging operations.
2. Deciduous Material: Dig deciduous materials in a dormant condition prior to breaking bud. If deciduous trees are dug in-leaf, they shall be watered to saturate the root balls and sprayed with an anti-desiccant prior to digging operations.
3. Digging times other than those indicated must be acceptable to the landscape architect.

B. Vegetation Removal:

1. Herbicide: Use Round Up (Monsanto Co.) as required to prepare areas for new planting, applied to all ground cover, evergreen and shrubbery beds and all mulch areas per manufacturer's recommendations. Clean area of all dead material after five (5) days. Reapply a second application as required.
2. Herbicides to be applied by licensed applicator as required by the State.
3. Mechanically strip all existing vegetation, including root systems from all proposed landscape areas. Excavate to the depths shown on the planting details and grading plans to accommodate new improvements.
4. Within the drip line of existing trees to remain, mechanical excavation and removal of existing materials shall be prohibited. All vegetation removal shall be by hand equipment to protect the existing root system. If excavation is required, it shall be achieved by hand equipment or compressed air jetting to protect the existing root system.

C. Individual plant locations shall be accurately staked according to the drawings with above ground brightly colored stakes clearly visible for review by the landscape architect. Staking to be approved by the landscape architect before any planting pits are dug. The landscape architect reserves the right to adjust plant material locations to meet field conditions, without additional cost to the owner.

D. Plant beds at grade shall be painted out with brightly colored marking paint clearly visible for review by the landscape architect. All bed lines are to be approved by the landscape architect prior to bed excavation. The landscape architect reserves the right to adjust bed edges to meet field conditions or to improve their functionality and or aesthetic appearance, without additional cost to the owner, as long as the required plant material to fill the adjusted bed has not been increased.

E. If obstructions are encountered that are not indicated, do not proceed with planting operations until alternative plant locations have been selected and approved in writing by the landscape architect. Where location or spacing dimensions are not clearly shown, request clarification by the landscape architect.

F. Excavate individual circular planting pits with sloped sides, flat bottoms and sized in accordance with outlines and dimensions shown on the planting details. Planting beds shall be mass

excavated with vertical sides to depth and dimensions as shown on the planting details and plans.

G. Contractor shall perform percolation testing per Section 3.1 B and provide test results to the landscape architect or owner's representative for approval before continuing planting operations. Should substrate drainage or soil conditions be encountered which would be detrimental to growth or survival of plant material, the contractor shall notify the landscape architect or owner's representative before proceeding.

3.3 INSTALLATION:

A. Planting

1. Trees in Individual Planting Pits: (Refer to planting details)

a. Scarify the sides of individual planting pits for deciduous and evergreen trees.
b. Set trees in the planting pit to proper grade and alignment according to the drawings and specifications. Bottom of the root flare to be flush with adjacent finish grade.
c. Set trees upright, plumb and faced to give the best appearance or relationship to each other or adjacent structure. No filling or mulching will be permitted around trunks above the bottom of root flare.
d. Planting backfill mix Type 'B' shall be installed. Pulverize existing soil (see 2.1, H) by hand shovel and compact around base of tree for stability. Do not use frozen or muddy soils for backfilling. Ensure soil is properly compacted without any air pockets.
e. Remove burlap (top 6"-8" or top 1/3 of root ball), roping twine and wires from the tops of root balls just before the final backfilling of the tree pit. Cut and dispose of legally, do not fold down into the planting soil.
f. If the tree ball has an outer wire basket that doesn't meet the requirements of a low-rise basket, remove the top 6"-8" of the basket wires just before the final backfilling of the tree pit. Dispose of metal wires legally, do not bury into the tree pit.
g. Ensure trees do not have circling or girdling roots. Notify the landscape architect or owner's representative prior to proceeding if root ball conditions do not meet specifications or root conditions detrimental to the health of the tree are present.
h. Install approved topsoil over existing soil fill. Do not use frozen or muddy soils for backfilling.
i. After trees are plumbed and backfill is installed, muddle backfill mixture around sides and base of root balls and fill all voids. Sufficiently compact to prevent settlement.
j. Form a ring of soil around the edge of each planting pit to retain water in non-irrigated areas.

2. Trees, Shrubs, Perennials: (Refer to planting details)

a. Scarify the sides of mass planting beds.
b. Backfill entire bed with approved pre-mixed planting backfill mix Type 'A'.
c. Space plants in accordance with indicated dimensions. Adjust spacing as necessary to evenly fill planting bed with indicated quantity of plants.
d. Ensure container grown plants are not root bound. Lightly separate root system by hand prior to setting plants into their final position to loosen roots and stimulate lateral root growth. Ensure root system is not damaged during this process and that root balls remain intact.
e. Plant shrubs and perennials to the edge of tree root balls, and to within 6" of the edge of plant bed, or as directed on the drawings.

f. Install trees within planting beds as outlined in Section 3.3,a,1,b,c,e,f,g and i.

B. Watering:

1. Water all trees and plants as required immediately after planting to achieve the proper soil moisture levels using a moisture meter.

a. Volumetric soil moisture level, in both the planting soil and the root balls of all plants, prior to, during and after planting shall be above permanent wilting point and below field capacity for each type of soil texture within the following ranges.

| **Soil type** | **Permanent wilting point** | **Field capacity** |
|---|---|---|
| Sand, Loamy sand, Sandy loam | 5-8% | 12-18% |
| Loam, Sandy clay, Sandy clay loam | 14-25% | 27-36% |
| Clay loam, Silt loam | 11-22% | 31-36% |
| Silty clay, Silty clay loam | 22-27% | 38-41% |

1) Volumetric soil moisture shall be measured with a digital moisture meter. The meter shall be the Digital Soil Moisture Meter, DSMM500 by General Specialty Tools and Instruments, or approved equivalent.

b. The contractor shall confirm the soil moisture levels with a moisture meter. If the moisture is too high, suspend planting operations until the soil moisture drains to below field capacity.

C. Mulching:

1. Mulch planting pits and beds with required mulching material to depths per details immediately after planting and watering. Rake mulch to provide a uniform finished surface. Ensure mulch does not cover the root flare of any plant material.

D. Wrapping, Guying, Staking:

1. Inspect trees for injury to trunks, evidence of insect infestation and improper pruning before wrapping.
2. Wrap trunks of all thin skinned trees (Beech, Maple, Willow, Linden, Dogwood, Honeylocust) spirally from bottom to top with specified tree wrap and secure in place.
3. Stake/guy all trees per details before lawn seeding or sodding operations and prior to acceptance. When high winds or other conditions which may affect tree survival or appearance occur, the contractor shall immediately stake/guy trees upon planting.

E. Pruning:

1. Prune plants only as directed by the landscape architect. Pruning trees shall be limited to addressing structural defects as shown in details; follow recommendations in “Structural Pruning: A Guide For the Industry” published by Urban Tree Foundation, Visalia, CA. or to remove broken branches.
2. All pruning shall be performed by a person experienced in shrub and/or structural tree pruning.
3. Remove and replace excessively pruned or malformed stock resulting from improper pruning that occurred in the nursery or after.
4. Pruning shall be done with clean, sharp tools.
5. No tree paint or sealants shall be used.

3.4 MAINTENANCE AND WARRANTY:

A. Refer to Section 320536 – Landscape Maintenance and Warranty Standards.

3.5 CLEANING:

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, soil, debris and equipment.

END OF SECTION 329300

# SECTION 334600 - UNDERDRAINAGE SYSTEM

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and General and Supplemental Requirements, which are hereby made a part of this Section.

### 1.2 DESCRIPTION OF WORK:

A. Extent of Underdrainage System work is shown on drawings.

B. Underdrainage System Work Includes the Following:

1. Perforated underdrains and connections to existing manholes and catch basins.
2. Rigid drainage system beneath pavement.

C. Related Work Specified Elsewhere: Refer to the entire manual for additional contract requirements,

### 1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data and installation instructions for underdrainage system materials and products.

B. Certification: Submit certification signed by underdrainage system installer that installed materials conform to specified requirements and system was successfully checked and tested prior to covering with drainage fill.

C. Record Drawings: At project closeout, submit record drawings of installed underdrainage system piping and products.

### 1.4 QUALITY ASSURANCE:

A. Installers' Qualifications: Firm with at least 3 years of successful installation experience on projects with underdrainage system work similar to that required for project.

B. Codes and Standards:

1. Plumbing Code Compliance: Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of underdrainage system's materials and products.

## PART 2 - PRODUCTS

### 2.1 CONDUCTING PIPES AND PIPE FITTINGS:

A. General: Provide pipes of the following materials, of weight/class indicated. Provide pipefittings and accessories of same material and weight/class as pipes, with joining method as indicated. See drawings for size of pipe required.

### 2.2 PERFORATED DRAINS:

A. Furnish drainage pipe complete with bends, reducers, adapters, couplings, collars and joint materials.

B. Provide corrugated, perforated, smooth lined H.D.P.E pipe with soil and water tight joints, AASHTO M-252 and M-294. Advanced Drainage Systems N-12 or approved equal. .

C. Manufacturer: Subject to compliance with requirements, provide drainage system products of one of the following:

1. Advanced Drainage Systems, Inc., 4640 Trueman Blvd., Hilliard, OH 43026, (800) 821-6710
2. Other approved.

2.3 RIGID DRAINAGE SYSTEM BENEATH PAVEMENT:

A. Provide polyvinyl chloride tubing for drainage and sleeving; see plans for sizing. All material shall be rigid, unplasticized, extruded from virgin parent material. Tubing shall conform with ASTM D-2241 Classification. Pipe shall be Schedule 40, homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, wornholes or dents.

B. Provide insert polyethylene fittings, ASTM D-2609, or PVC fittings with gasketed joints.

2.4 TRENCH MATERIALS:

A. Drainage Fill (Perforated): Evenly graded mixture of clean, washed pea stone.

B. Impervious Fill (Rigid): Clayey gravel and sand mixture capable of compacting to a dense composite.

C. Filter Fabric: Approved non-woven cloth filter fabric from one of the following suppliers, or approved substitute:

1. US Fabrics US 120NW
2. Mirafi 140 N

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Installer must examine the areas and conditions under which underdrainage system work is to be installed and notify the General Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.2 PERFORATED DRAINAGE SYSTEM:

A. Excavation:

1. Excavate for underdrainage system to provide a clear horizontal distance between drain pipe and trench wall on both sides not less than 2 times diameter of drain pipe and sufficient depth to provide not less than 4" compacted impervious fill unless subgrade is already equivalent of impervious fill. Grade bottom of trench excavations to required slope and compact to a firm, solid bed for drain system.
2. Line top of trench with non-woven filter fabric per details, provide extra material for cover over top of trench.
3. Install and compact drainage fill material to not less than 4" depth in bottom of trench.

B. Laying Drain Pipe:

1. Lay perforated pipe solidly bedded in filtering material (pea stone). Provide full bearing for each pipe section throughout its length to true grades and alignment, and continuous slope in the direction of flow.
2. Lay perforated pipe with perforations down and joints tightly closed in accordance with pipe manufacturer’s recommendations. Provide collars and couplings as required.
3. Connect pipe runs per plans. Provide positive unobstructed flow.
4. Clean out drainage system, remove all soil and debris that has entered system during construction.

C. Testing Drainage Lines:

1. Test or check lines before backfilling to assure free flow. Remove obstructions, replace damaged components and retest system until satisfactory.
2. After testing drain lines, place not less than 4” additional drainage fill material on top of drain line and either side.

D. Drainage Fill: (Type 1 Drainage Trench)

1. Backfill trench with peastone fill to encapsulate, cover and fill trench to proposed subgrade per detail.
2. Cover backfill with non-woven cloth filter fabric. Ensure complete coverage of drainage fill prior to installing proposed paving aggregate stone base or plant mix backfill as reflected in details.

3.3 RIGID DRAIN SYSTEM:

A. Excavation:

1. Excavate for underdrainage system to provide a clear horizontal distance between drain pipe and trench wall on both sides not less than 2 times diameter of drain pipe and sufficient depth to provide not less than 4" compacted impervious fill unless subgrade is already equivalent of impervious fill. Grade bottom of trench excavations to required slope and compact to a firm, solid bed for drain system.
2. Install and compact impervious fill material to not less than 4" depth in bottom of trench.

B. Laying Drain Pipe:

1. Lay drainpipe solidly bedded in compacted sand material 95% density (see drawings). Provide full bearing for each pipe section throughout its length, to true grades and alignment, and continuous slope in the direction of flow.
2. Lay rigid pipe with joints tightly closed in accordance with pipe manufacturer's recommendations. Provide collars and couplings as required.
3. Connect rigid PVC to perforated drain tile at walks. Provide positive unobstructed flow.
4. Clean out drainage system, remove all soil and debris that has entered system during construction.

C. Testing Drain Lines:

1. Test or check lines before backfilling to assure free flow. Remove obstructions, replace damaged components, and retest system until satisfactory.
2. After testing drain lines, place not less than 4" additional impervious fill material top of drains and either side.

D. Impervious Backfill Fill:

1. Backfill impervious fill (gravel/sand mixture) to encapsulate, cover and fill trench to top of subgrade conditions per details.
2.

3.4 BACKFILLING:

A. General: Conduct backfill operations closely following laying, jointing, and bedding of pipe, and after initial inspection and testing are completed.

3.5 FIELD QUALITY CONTROL:

A. Testing: Perform testing of completed piping in accordance with local authorities having jurisdiction.

END OF SECTION 334600

## APPENDIXES