CONTRACT DOCUMENTS

GRACE MACDONALD PARK

East Bay Charter Township
1965 N. Three Mile Rd
Traverse City, MI 49696

January 2026

Wade Trim Associates, 500 Griswold, Suite 2500, Detroit, Michigan 48226

EBT343801D

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The Plans bearing the general title of Grace MacDonald Park and dated January 2026 are included with and form a part of the Contract Documents for this Project.

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SECTION 00 11 13
ADVERTISEMENT FOR BIDS
GRACE MACDONALD PARK

PART 1 GENERAL

1.01 OWNER

A. Owner: East Bay Charter Township, 1965 N Three Mile Rd, Traverse City, MI 49696

B. Designated representative: Beth Friend

1.02 PROJECT INFORMATION

A. Grace MacDonald Park, 133 E Arbutus Lake Rd, Traverse City, MI 49696

1.03 BIDDING PROJECT

A. Sealed Bids will be received by East Bay Charter Township at the Clerk's Office, 133 E Arbutus Lake Rd, until 2:00 pm, Local Time, 02-10-2026, at which time and place said Bids will be opened and publicly read aloud.

B. After the bid closing time, Bids will be reviewed and publicly read aloud at the East Bay Charter Township, Clerk's Office.

1.04 DESCRIPTION OF WORK

A. Bids will be received for the following Work:

1. East Bay Township is seeking to improve Grace Macdonald Park with a number of improvements in 2026 and 2027. Contractor has choice of Spring 2026 or Fall 2026 construction. Please specify your preference for construction as Spring, Fall, or Both. The intended 2026 construction work contains the following improvements:

   Base Bid: Construction of two concrete cornhole courts with adjoining ADA concrete walkway connections.

   Alternate 1: Construction of an additional four concrete cornhole courts.

   Alternate 2: Additional seating area and new fire pit and seatwall adjacent to the pavilion with new gas and electrical lines.

   Alternate 3: A substitution of concrete pavement instead of pavers at the Alternate 2 fire pit area.

   The intended 2027 construction work is included in these bid documents for budgetary purposes. The request is for budgetary costs on Alternates 4-7 to prepare for 2027 construction. Budgetary numbers can be based on 2026 construction costs, with the intention of updating these costs for 2027 construction later this year to award the Alternate 4-7 projects.

   a. Alternate 4: Concrete curb along parking lot to assist with drainage by the baseball bleacher area.

      Alternate 5: Construction of a new walkway, seating area, seatwall, and new hoops at the basketball court.

   b. Alternate 6: Construction of new walkways throughout the park to connect the restroom, playgrounds, baseball bleachers, and future dog park.

      Alternate 7: Converting the existing sports field into a new dog park including concrete seating areas, pavilions, fencing, dog amenity structures, and a dog wash station with water, sanitary, and electrical.

1.05 CONTRACT DOCUMENTS

A. Contract Documents may be examined at the following locations:

1. East Bay Charter Township, 1965 N. Three Mile Rd, Traverse City, MI 49696
2. Wade Trim Associates, 10850 E Traverse Hwy #2260, Traverse City, MI 49684

B. Plans and specifications are also available for viewing (not to be used for bidding purposes) at no cost online at: www.wadetrim.com/resources/bid-tab/

1.06 RECEIPT OF BIDS.

A. Printed, sealed copies of bids will be received by the East Bay Charter Township Clerk's Office as outlined in the Supplemental Instructions to Bidders. It is the responsibility of bidder to verify bid has been received by Township Clerk. Shortly after the bid closing time a bid tabulation will be prepared and posted online.

B. Each Proposal shall be accompanied by a bid bond, in the amount of at least five (5) percent of the amount bid, drawn payable to East Bay Charter Township as security for the proper execution of the Agreement.

C. East Bay Charter Township reserves the right to accept or reject any or all bids and to waive any informality in any bids should it consider same to be in its best interest.

D. Bids may not be withdrawn for the period of 60 days after date of receiving bids.

E. Inquiries will be directed to Matt D. Clark, Landscape Architect at Phone: (313) 456-8569 or email: mdclark@wadetrim.com.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

SECTION 00 21 13 - INSTRUCTIONS TO BIDDERS

PART 1 GENERAL

1.01 DEFINED TERMS

A. Terms used in these Instructions to Bidders have the meanings assigned to them in the General Conditions.

B. The term "Bidder" means one who submits a Bid to Owner as distinct from a subbidder who submits a Bid to a Bidder.

C. The term "Successful Bidder" means the lowest, qualified, responsible Bidder to whom the Owner makes an award.

D. The term "Owner" means East Bay Charter Township, 1965 N. Three Mile Rd, a Municipal Corporation and being a party of the first part of this Contract.

E. The term “Landscape Architect” means Wade Trim, Wade Trim Associates, 500 Griswold, Suite 2500, Detroit, Michigan 48226, or a duly authorized representative.

1.02 BIDDERS QUALIFICATIONS

A. No Bid will be considered from any Bidder unless known to be skilled and regularly engaged in work of a character similar to that covered by the Contract Documents. In order to aid the Owner in determining the responsibility of any Bidder, the Bidder, within 48 hours after being requested in writing by the Owner to do so, must furnish evidence, satisfactory to the Owner, of the Bidder's experience and familiarity with Work of the character specified, and Bidder's financial ability to properly prosecute the proposed Work to completion within the specified time. The evidence requested may include the following:

1. Address and description of the Bidder's plant or permanent place of business.

2. Bidder's performance records for all Work awarded to or started by Bidder within the past three years.

3. An itemized list of the Bidder's equipment available for use on the proposed Contract.

4. Bidder's financial statement, including statement of ownership of equipment necessary to be used in executing Work under Contract.

5. Evidence that the Bidder is authorized to do business in the state in which the project is located, in case of a corporation organized under the laws of any other state; and,

6. Such additional information as will satisfy the Owner that the Bidder is adequately prepared to fulfill the Contract.

1.03 EXAMINATION OF CONTRACT DOCUMENTS AND SITE

A. It is the responsibility of each Bidder before submitting a Bid, to:

1. Examine the Contract Documents thoroughly,

2. Visit the site to familiarize himself with local conditions that may in any manner affect cost, progress or performance of the Work,

3. Consider federal, state, and local Laws and Regulations that may affect cost, progress, performance, or furnishing of the Work; and

4. Study and carefully correlate Bidder's knowledge and observations with the Contract Documents and such other related data; and

5. Promptly notify the Landscape Architect in writing of conflicts, errors, ambiguities or discrepancies which Bidder has discovered in or between Contract Documents and such related documents.

6. Purchase official Procurement Documents from the Landscape Architect in order to be included on the project Plan Holder List and be considered eligible for bidding.

B. Reference is made to the Supplementary Conditions for the identification of those reports of investigations and tests of subsurface and latent physical conditions at the site or otherwise affecting cost, progress or performance of the Work which have been relied upon by the Landscape Architect in preparing the Contract Documents.

1. If such reports are not included as appendices to the Contract Documents, the Owner will make copies available to any Bidder requesting them. These reports are included for reference only and are not guaranteed as to accuracy or completeness, nor are they part of the Contract Documents.

2. Bidder may rely upon the general accuracy of the “technical data” contained in such reports but not upon other data, interpretations, opinions or information contained in such reports or otherwise relating to the subsurface conditions at the site, nor upon the completeness thereof for bidding or construction purposes.

3. Before submitting their Bid each Bidder will, at Bidder's own expense, make such additional investigations and tests as the Bidder may deem necessary to determine Bidder's Bid for performance of the Work in accordance with the time, price and other terms and conditions of the Contract Documents.

C. On request, the Owner will provide each Bidder access to the site to conduct such investigations and tests as each Bidder deems necessary for submission of their Bid. Bidder must fill all holes and clean up and restore the site to its former conditions upon completion of such investigations and tests.

D. The lands upon which the Work is to be performed, rights-of-way for access thereto and other lands designated for use by the Contractor in performing the Work are identified in Section 01 11 00 - Summary of Work, or on the Plans.

E. The locations of utilities as shown on the Plans are taken from sources believed to be reliable. Neither the Owner nor the Landscape Architect will be responsible for any omissions of, or variations from, the indicated location of existing utilities which may be encountered in the Work.

1. The submission of a Bid will constitute an incontrovertible representation by the Bidder that the Bidder has complied with every requirement of this Article, that without exception the Bid is based upon performing and furnishing the Work required by the Contract Documents and applying the specific means, methods, techniques, sequences or procedures of construction (if any) that may be shown, indicated or required by the Contract Documents, that Bidder has given the Landscape Architect written notice of all conflicts, errors,

ambiguities and discrepancies that Bidder has discovered in Contract Documents and the resolution by the Landscape Architect is acceptable to Bidder, and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performing and furnishing the Work, and that the time stated in the Proposal is sufficient to complete the project.

1.04 INTERPRETATIONS AND ADDENDA

A. Should any prospective bidder find discrepancies in, or omissions from the Plans, Specifications or other parts of the Contract Documents, the prospective bidder may submit a written request to the Landscape Architect for an interpretation thereof. The person submitting the request will be held responsible for its prompt delivery at least seven (7) days prior to the date for opening of Bids. Questions received less than seven (7) days prior to the date for opening of bids will not be answered. Any interpretation of inquiry will be made by Addendum duly issued to all prospective bidders.

B. Any change in or addition to the Contract Documents deemed necessary by the Owner must be made in the form of an Addendum issued to all prospective bidders who have taken out Contract Documents and all such Addenda will become a part of the Contract Documents as though same were incorporated into same originally. Oral explanations and information do not constitute official notification and are not binding.

1.05 BID SECURITY

A. Bid Security must be made payable to the Owner, in an amount of **five (5)** percent of the Bidder's maximum Bid price, as indicated in Section 00 11 13 - Advertisement for Bids. Bid Bonds, if indicated as acceptable in Section 00 11 13, will be issued on the form included in the Contract Documents by a Surety meeting the requirements of paragraph 5.01 of Section 00 72 00 - General Conditions.

B. Bid Security of the Successful Bidder will be retained until such Bidder has executed Section 00 52 00 - Agreement and furnished the required Contract Security, whereupon it will be returned; if the Successful Bidder fails to execute and deliver the Agreement and furnish the required Contract Security within 15 days of the Notice of Award, the Owner may annul the Notice of Award and the Bid Security of that Bidder will be forfeited.

C. Bid Security of any Bidder whom the Owner believes to have a reasonable chance of receiving the award may be retained by the Owner until the earliest of the seventh day after the "Effective Date of Agreement" (which term is defined in the General Conditions) or the expiration of the hold period on the Bids. Bid Security of other Bidders will be returned within 14 days of the Bid opening, unless indicated otherwise in the Advertisement.

1.06 CONTRACT TIME

A. The number of days within which, or the date by which, the Work is to be Substantially Completed, if applicable, and also completed and ready for final payment (the Contract Time) are set forth in the Agreement.

1.07 SUBSTITUTE AND “OR-EQUAL” ITEMS

A. The Contract, if awarded, will be on the basis of materials and equipment described in the Plans or specified in the Specifications without consideration of possible substitute or “or-equal” items.

B. Whenever it is indicated in the Plans or specified in the Specifications that a substitute or an “or-equal” item of material or equipment may be furnished or used by the Contractor if acceptable to the Landscape Architect, application for such acceptance will not be considered by the Landscape Architect until after the effective date of the Agreement.

C. In addition, in no case will the Landscape Architect’s denial of the Contractor’s application give rise to any claim for additional cost, it being understood by the Contractor that acceptance of substitute or an “or equal” item of material is at the sole discretion of the Landscape Architect.

1.08 RECEIPT AND FORM OF BID

A. Bids must be submitted at the time and place indicated in the Advertisement for Bids and must be accompanied by the Bid Security and other required documents.

1. Bids must be in an opaque sealed envelope, marked with the Project title and name and address of the Bidder and accompanied by the Bid Security and other required documents.

2. If the Bid is sent through the mail or other delivery system, the sealed envelope must be enclosed in a separate envelope with the notation "BID ENCLOSED" on the face thereof.

B. Bids received after the scheduled time and place indicated in the Advertisement for Bids will be returned unopened.

C. Owner invites bids on the Proposal and any other form(s) attached thereto.

D. The complete set of Contract Documents must be used in preparing Bids; neither the Owner nor the Landscape Architect assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Contract Documents.

E. Bidder must acknowledge of receipt of Addenda as provided for in the electronic bidding platform. Failure to acknowledge Addenda will be cause for rejection of bid.

F. The Legal Status of Bidder Form, located in Section 00 43 45 - Legal Status of Bidder, must be submitted with each Bid and must clearly state the legal position of a Bidder. In the case of a corporation, the home address, name and title of all officers must be given. In the case of a partnership, show names and home addresses of all partners. If an individual, so state. Any individual bid not signed by the individual must have attached, thereto, a power of attorney evidencing authority to sign.

G. Other documents to be attached to the Proposal and made a condition thereof are identified in the Proposal.

H. A tabulation of the amounts of the base bids and any alternates will be made available after the opening of Bids.

I. To obtain Contract Documents and submit a Bid, Bidders:

1.09 MODIFICATIONS AND WITHDRAWAL OF BIDS

A. Bids may be modified or withdrawn by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.

B. If, within 24 hours after Bids are opened, any Bidder files a duly signed written notice with the Owner and promptly thereafter demonstrates to the reasonable satisfaction of the Owner that there was a material and substantial mistake in the preparation of their Bid, that Bidder may withdraw their Bid and the Bid Security will be returned.

1. Thereafter, at the sole option of the Owner, that Bidder will be disqualified from further Bidding on the Work to be provided under the Contract Documents.

1.10 AWARD OF CONTRACT

A. Owner reserves the right to reject any and all Bids for any reason, to waive any and all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder, and the right to disregard all nonconforming, non-responsive, unbalanced, or conditional Bids.

B. Discrepancies between words and figures will be resolved in favor of words. Discrepancies in the multiplication of units of work and unit prices, will be resolved in favor of unit price.

C. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

D. In evaluating Bids, the Owner will consider the qualifications of the Bidders, whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data if requested in the Bid forms. It is the Owner's intent to accept alternates (if any are accepted) in the order in which they are listed in the Bid form but the Owner may accept them in any order or combination.

E. Subject to the approval of the Owner, the Contract will be awarded to the lowest responsive and responsible Bidder. Responsibility of Bidder will be determined on basis of past performance and Work of similar character, equipment and labor available to do the Work and financial status.

F. The Contract will be considered to have been awarded after the approval of the Owner has been duly obtained and a formal Notice of Award duly served on the Successful Bidder by the Owner.

G. If the Contract is to be awarded, the Owner will give the Successful Bidder a Notice of Award within 60 days after the day of the Bid opening, unless such other time is specified in the Advertisement for Bids.

H. The Contract will not be binding upon the Owner until the Agreement has been duly executed by the Bidder and the duly authorized officials of the Owner.

1.11 SIGNING OF AGREEMENT

A. Within fifteen (15) days after the Owner gives a Notice of Award to the Successful Bidder, the Contractor must sign and deliver the specified number of counterparts of the Agreement to the Owner with all other Contract Documents attached.

B. Within ten (10) thereafter, the Owner will deliver two (2) fully signed counterparts to the Contractor. Landscape Architect will identify, date or correct those portions of the Contract Documents not fully signed, dated or executed by the Owner and the Contractor and such identification, dating or correction will be binding on all parties.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 00 42 43 - A
PROPOSAL

Owner: East Bay Charter Township

Project: Grace MacDonald Park

Project Location: 133 E Arbutus Lake Rd, East Bay Township, 49696

BIDDER INFORMATION

Bidder Name: _____

By (Printed Name): _____

Signature: _____

Address: _____

Phone No: _____

Email: _____

Bidder proposes and agrees, if their Bid is accepted, to enter into an Agreement with the East Bay Charter Township in the form included in the Contract Documents to complete all Work as specified or indicated in the Contract Documents for the Contract Price and within the Contract Time indicated in the Agreement, and in accordance with the Contract Documents.

In submitting their Bid, Bidder represents, as more fully set forth in the Agreement, that:

Bidder has examined copies of Contract Documents, (consisting of Plans dated January 12, 2026 and Project Manual dated January 12, 2026) which Bidder understands and accepts as sufficient for the purpose, including any and all Addenda officially issued, the receipt of which has been acknowledged.

A. Addendum _____ Acknowledged by: _____ Date: _____

B. Addendum _____ Acknowledged by: _____Date: _____

C. Addendum _____ Acknowledged by: _____ Date: _____

Bidder has examined the surface and subsurface conditions where the Work is to be performed, the legal requirements and local conditions affecting cost, progress, furnishing or performance of the Work, and has made such independent investigations as Bidder deems necessary.

Bidder, by submitting a Bid, agrees that their Bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation and is not submitted in conformity with any Agreement or rules of any group, association, organization or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any person, firm or a corporation to refrain from bidding; and Bidder has not sought by collusion to obtain for himself any advantage over any other Bidder or over the Owner.

Bidder agrees to complete the Work, in accordance with the Contract Documents, for the following Contract Price:

Base Bid: Two Cornhole Courts with ADA Walkways

Item	Description	Quantity	Unit	Unit Price	Amount
1.	Mobilization (5% Max)	1	Lump Sum	$_____	$_____
2.	Project Signage	1	Lump Sum	$_____	$_____
3.	Soil Erosion & Sedimentation Control	1	Lump Sum	$_____	$_____

4.	Excavation for Concrete, Haul Dirt Off-Site	65	Cubic Yard	$_____	$_____
5.	Remove Tree and Stump, Spread Stump Grindings On-Site	1	Each	$_____	$_____
6.	Remove Lawn	250	Square Yard	$_____	$_____
7.	Remove Stone Adjacent to Parking Lot	20	Cubic Yard	$_____	$_____
8.	Construction Staking	1	Lump Sum	$_____	$_____
9.	Site Grading, 5,000 SF	1	Lump Sum	$_____	$_____
10.	Irrigation System with Main Line and Spray Heads	1	Lump Sum	$_____	$_____
11.	Concrete Cornhole Courts, Exposed Agg, 4" Min Depth on 21AA Comp Base	165	Square Foot	$_____	$_____
12.	Concrete Cornhole Courts, Broom Finish, 4" Min Depth on 21AA Comp Base	500	Square Foot	$_____	$_____
13.	Concrete Walkways, Broom Finish, 4" Min Depth on 21AA Comp Base	2,215	Square Foot	$_____	$_____
14.	Crushed Stone Border Adjacent to Parking Lot	5	Cubic Yard	$_____	$_____
15.	Outcropping Stone Retaining Wall	62	Linear Foot	$_____	$_____
16.	Dumor Bench 88	1	Each	$_____	$_____
17.	Cornhole Boards, Set of 2	2	Each	$_____	$_____
18.	Seeded Lawn Restoration	275	Square Yard	$_____	$_____
19.	Double Shredded Hardwood Mulch	12	Cubic Yard	$_____	$_____

Total Contract Price (Items 1 through 19) $_____

Alternate 1: Four Additional Cornhole Courts

Item	Description	Quantity	Unit	Unit Price	Amount
20.	Soil Erosion & Sedimentation Control	1	Lump Sum	$_____	$_____
21.	Construction Staking	1	Lump Sum	$_____	$_____
22.	Excavation for Concrete, Haul Dirt Off-Site	25	Cubic Yard	$_____	$_____
23.	Remove Lawn	175	Square Yard	$_____	$_____
24.	Site Grading	1	Lump Sum	$_____	$_____
25.	Irrigation System with Spray Heads	1	Lump Sum	$_____	$_____
26.	Concrete Cornhole Courts, Exposed Agg, 4" Min Depth on 21AA Comp Base	363	Square Foot	$_____	$_____

27.	Concrete Cornhole Courts, Broom Finish, 4" Min Depth on 21AA Comp Base	647	Square Foot	$_____	$_____
28.	Outcropping Stone Retaining Wall	30	Linear Foot	$_____	$_____
29.	Stepping Stones, base included	20	Linear Foot	$_____	$_____
30.	Dumor Bench 88	2	Each	$_____	$_____
31.	Cornhole Boards, Set of 2	4	Each	$_____	$_____
32.	Seeded Lawn Restoration	150	Square Yard	$_____	$_____
33.	Double Shredded Hardwood Mulch	2	Cubic Yard	$_____	$_____

Total Contract Price (Items 20 through 33) $_____

Alternate 2:Seating Area with Fire Pit and Utilities

Item	Description	Quantity	Unit	Unit Price	Amount
34.	Soil Erosion & Sedimentation Control	1	Lump Sum	$_____	$_____
35.	Construction Staking	1	Lump Sum	$_____	$_____
36.	Excavation for Concrete Walk and Retaining Wall, Keep Dirt On-Site	20	Cubic Yard	$_____	$_____
37.	Site Grading	1	Lump Sum	$_____	$_____
38.	Techo-Bloc Eva Smooth Pavers, Chestnut brown	700	Square Foot	$_____	$_____
39.	Techo-Block Prescott Seat Wall with Cap, double sided	108	Linear Foot	$_____	$_____
40.	Electrical Line w/ 2" PVC conduit & Connections	160	Linear Foot	$_____	$_____
41.	1" Gas Line w/ Connections	108	Linear Foot	$_____	$_____
42.	Exterior Weatherproof Electrical Outlets	2	Each	$_____	$_____
43.	Techo-Bloc Prescott Firepit in Rock Garden	1	Lump Sum	$_____	$_____
44.	Emergency Gas Shut-off Valve	1	Each	$_____	$_____
45.	Timer Switch for Fire Pit	1	Each	$_____	$_____
46.	Seeded Lawn Restoration	150	Square Yard	$_____	$_____
47.	Double Shredded Hardwood Mulch	2	Cubic Yard	$_____	$_____

Total Contract Price (Items 34 through 47) $_____

Alternate 3:Concrete Seating Area

Item	Description	Quantity	Unit	Unit Price	Amount

48.	Concrete Pavement, Broom, 4" Min Depth on 21AA Comp Base in-lieu of Pavers	700	Square Foot	$_____	$_____
49.	Deduct Techo-Bloc Eva Smooth Pavers, Chestnut Brown	700	Square Foot	$_____	$_____

Total Contract Price (Items 48 through 49) $_____

Total Contract Price (Base Bid & Alternates 1,2, & 3) $_____

Preferred timeline for construction (Spring 2026, Fall 2026. Or Either): _____

Bidder, by submitting a Bid, thereby certifies that Bidder or a qualified designated person in Bidder's employ has examined the Contract Documents provided by the Owner for bidding purposes. Further, they certify that Bidder or Bidder's qualified employee has reviewed the Bidder's proposed construction methods and finds them compatible with the conditions which Bidder anticipates from the information provided for Bidding.

Bidder, by submitting a Bid, agrees to complete the Work under any job circumstances or field conditions present and/or ascertainable prior to bidding. In addition, Bidder agrees to complete the Work under whatever conditions Bidder may create by Bidder's own sequence of construction, construction methods, or other conditions he may create, at no additional cost to the Owner.

Bidder, by submitting a Bid, declares that Bidder has familiarized them self with the location of the proposed Work and the conditions under which it must be constructed. Also, Bidder has carefully examined the Plans, the Specifications, and the Contract Documents, which Bidder understands and accepts as sufficient for the purpose, and agrees that Bidder will Contract with the Owner to furnish all labor, material, tools, and equipment necessary to do all Work specified and prescribed for the completion of the Project.

Bidder will provide a bid bond, in the amount of at least **five (5)** percent of the amount Bid, drawn payable to East Bay Charter Township as security for the proper execution of the Agreement.

Bidder, by submitting a Bid, agrees that if awarded Contract, to sign the Agreement and submit satisfactory bonds and certificates of insurance coverage and other evidence of insurance required by the Contract Documents within 15 days after the date of Owner's Notice of Award.

Bidder, by submitting a Bid, agrees that time is of the essence and, if awarded Contract, that the Work will be Completed on or before the dates/days as specified in the Agreement.

Liquidated damages, as specified in the General Conditions, Supplementary Conditions and Agreement, will also apply to the Substantial Completion date.

Engineering and inspection costs incurred after the final completion date will be paid by the Contractor to the Owner as specified in the Conditions of the Contract and Agreement.

Proposals may not be withdrawn for a period of 60 days after bid opening.

The following documents are made a condition of this Proposal:

A. Required Bid Security

B. Legal Status of Bidder

C. Non-Collusion Affidavit

SECTION 00 42 43-B
BUDGETARY PRICING REQUEST

East Bay Charter Township is seeking contractor pricing for Alternates 4-7 for budgetary and planning purposes for projected 2027 construction. Pricing for these items can be filled out in the charts below. Submitting budgetary pricing for these alternates is voluntary and failure to submit will not result in a rejection of the contactor's bid.

Alternate 4: Baseball Bleacher Drainage Curb

Item	Description	Quantity	Unit	Unit Price	Amount
50.	Mobilization (5% Max)	1	Lump Sum	$_____	$_____
51.	Construction Staking	1	Lump Sum	$_____	$_____
52.	Excavation for Concrete Walk and Retaining Wall, Keep Dirt On-Site	6	Cubic Yard	$_____	$_____
53.	Site Grading	1	Lump Sum	$_____	$_____
54.	Concrete Curb 12" Wide	175	Linear Foot	$_____	$_____
55.	Seeded Lawn Restoration	100	Square Yard	$_____	$_____
56.	Egg Rocks or Cobbles	1.5	Cubic Yard	$_____	$_____
57.	6A Sub Base	1	Cubic Yard	$_____	$_____
58.	Mirafe Weed Barrier	100	Square Foot	$_____	$_____

Total Contract Price (Items 50 through 58) $_____

Alternate 5: Basketball Court

Item	Description	Quantity	Unit	Unit Price	Amount
59.	Mobilization (5% Max)	1	Lump Sum	$_____	$_____
60.	Construction Staking	1	Lump Sum	$_____	$_____
61.	Soil Erosion & Sedimentation Control	1	Lump Sum	$_____	$_____
62.	Remove Basketball Hoops, Posts, and Footings	6	Each	$_____	$_____
63.	Remove Tree and Grind Stumps, Haul Off-Site	10	Each	$_____	$_____
64.	Excavation for Concrete Walk and Retaining Wall, Keep Dirt On-Sit	62	Cubic Yard	$_____	$_____
65.	Site Grading	1	Lump Sum	$_____	$_____
66.	Techo-Block Prescott Seat Wall with Cap, double sided	114	Linear Foot	$_____	$_____
67.	Boulder Retaining Walls, Average 2' Ht.	100	Linear Foot	$_____	$_____
68.	Concrete Stairs, 3 Risers	1	Lump Sum	$_____	$_____

69.	Concrete Pavement, Broom, 4" Min Depth on 21AA Comp Base	1,475	Square Foot	$_____	$_____
70.	Basketball Hoops with Footings	6	Each	$_____	$_____

Total Contract Price (Items 59 through 70) $_____

Alternate 6: Expanded Walkway and Bleacher Seating

Item	Description	Quantity	Unit	Unit Price	Amount
71.	Mobilization (5% Max)	1	Lump Sum	$_____	$_____
72.	Construction Staking	1	Lump Sum	$_____	$_____
73.	Soil Erosion & Sedimentation Control	1	Lump Sum	$_____	$_____
74.	Remove Tree and Grind Stumps, Haul Off-Site	4	Each	$_____	$_____
75.	Excavation for Concrete Walk, Keep Dirt On-Site	78	Cubic Yard	$_____	$_____
76.	Site Grading	1	Lump Sum	$_____	$_____
77.	Concrete Pavement, Broom Finish, 4" Min Depth on 21AA Comp Base	3,140	Square Foot	$_____	$_____
78.	Seeded Lawn Restoration	350	Square Yard	$_____	$_____

Total Contract Price (Items 71 through 78) $_____

Alternate 7: Dog Park Including Dog Wash Station and Drinking Foutain Utilities

Item	Description	Quantity	Unit	Unit Price	Amount
79.	Mobilization (5% Max)	1	Lump Sum	$_____	$_____
80.	Construction Staking	1	Lump Sum	$_____	$_____
81.	Soil Erosion & Sedimentation Control	1	Lump Sum	$_____	$_____
82.	Remove Sports Post Equipment	2	Each	$_____	$_____
83.	Remove Benches	4	Each	$_____	$_____
84.	Limb-up Trees to Minimum 6' Ht	1	Lump Sum	$_____	$_____
85.	Remove Chain Link Fence	120	Linear Foot	$_____	$_____
86.	Excavation for Concrete Walk, Keep Dirt On-Site	34	Cubic Yard	$_____	$_____
87.	Remove Wooden Retaining Wall	152	Linear Foot	$_____	$_____
88.	Site Grading	1	Lump Sum	$_____	$_____
89.	4’ Ht Chain Link Fence	912	Linear Foot	$_____	$_____

90.	4' Ht Double 6' Wide Chain Link Gates	3	Each	$_____	$_____
91.	4' Ht and 4' Wide Chain Link Gate	6	Each	$_____	$_____
92.	Removable Fence Post Sleeves	28	Each	$_____	$_____
93.	Concrete Pavement, Broom Finish, 4" Min Depth on 21AA Comp Base	1,382	Square Foot	$_____	$_____
94.	Dumor 88 Bench	29	Each	$_____	$_____
95.	Large Dog play amenities	1	Allowance	$40,000	$40,000
96.	Small Dog play amenities	1	Allowance	$15,000	$15,000
97.	Double Shredded Hardwood Mulch for Dog Amenity Areas	115	Cubic Yards	$_____	$_____
98.	1" Water Line with Connections and Curb Stop Valve	182	Linear Foot	$_____	$_____
99.	Sanitary Yard Hydrant	1	Each	$_____	$_____
100.	Crushed Limestone, 6AA	8	Cubic Yard	$_____	$_____
101.	10x10 Mid Valley Structures Timber Ridge Pavilion with Footings	1	Each	$_____	$_____
102.	12x12 Mid Valley Structures Timber Ridge Pavilion with Footings	1	Each	$_____	$_____
103.	Dog-On-It HDPE 33 Gallon Rec	5	Each	$_____	$_____
104.	Dog-On-It Elite Pet Waste Station	5	Each	$_____	$_____
105.	Modify existing irrigation system	1	Allowance	$25,000	$25,000
106.	Sail Shades by Shade Systems Inc with Footings	2	Each	$_____	$_____
107.	Seeded Lawn Restoration	1,000	Square Foot	$_____	$_____
108.	Double Shredded Hardwood Mulch for Planting Beds	3	Cubic Yard	$_____	$_____
109.	Grass, Sporobolus heterolepis, #1 cont.	28	Each	$_____	$_____
110.	Grass, Schizachyrium scoparium, #1 cont.	16	Each	$_____	$_____
111.	Perennial, Tiarella cordifolia, #1 cont.	19	Each	$_____	$_____
112.	Shrub, Cornus sericea, #5 cont.	6	Each	$_____	$_____

113.	Tree, Cercis canadensis, 2" cal.	6	Each	$_____	$_____
114.	Tree, Tilia americana, 2" cal.	5	Each	$_____	$_____
115.	Tree, Pinus strobus, 8' ht.	6	Each	$_____	$_____

Total Contract Price (Items 79 through 115) $_____

SECTION 00 43 13
BID BOND FORM

KNOW ALL BY THESE PRESENT, that we, the undersigned, _____ as Principal, hereinafter called the Principal, a corporation duly organized under the laws of the State of _____, and duly authorized to transact business in the state of Michigan, as Surety, _____, hereinafter called the Surety, are held and firmly bound unto the Owner, hereinafter called Owner, in the sum of _____ Dollars ($_____) for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a Bid for Grace MacDonald Park.

NOW, THEREFORE, if the Owner accepts the Bid of the Principal and the Principal will enter into a Contract with the Owner in accordance with the terms of such Bid, and give such Bond or Bonds as may be specified in the Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such Bond or Bonds, if the Principal pays to the Owner the difference not-to-exceed the penalty hereof between the amount specified in said Bid and such larger amount for which the Owner may in good faith contract with another party to perform the Work covered by said Bid, then this obligation will be null and void, otherwise to remain in full force and effect.

Signed and sealed this _____ day of _____, 20___.

_____	_____
(Witness)	(Principal)
	_____
	(Title)
_____	_____
(Witness)	(Surety)
	_____
	(Title)

SECTION 00 43 45
LEGAL STATUS OF BIDDER

(The Bidder should check the appropriate box and complete the information requested therein)

☐ A corporation, duly authorized and doing business under the laws of the State of Michigan, for whom _____ whose signature is affixed to this Bid, is duly authorized to execute contracts.

☐ A limited liability company, duly authorized and doing business under the laws of the State of Michigan, for whom _____, whose signature is affixed to this Bid, is duly authorized to execute contracts.

☐ A partnership, all partners with their addresses are:

_____ _____

_____ _____

_____ _____

☐ An individual, whose signature is affixed to this Bid.

_____ _____

SECTION 00 45 13
STATEMENT OF BIDDER'S QUALIFICATIONS

This Proposal is submitted in the name of:

(Print) _____

The undersigned hereby designates the following business address to which all notices, directions or other communications may be served or mailed:

Street: _____ City: _____

State: _____ Zip Code: _____

The undersigned hereby declares their legal status as checked below:

- ☐ Sole Proprietor
- ☐ Sole Proprietor doing business under an assumed name
- ☐ Co-partnership

The Assumed Name of the Co-Partnership is registered in the County of _____,

- ☐ Corporation incorporated under the laws of the State of _____.

The Corporation is:

- ☐ authorized to conduct business in the State of
- ☐ not now authorized to conduct business in the State of
- ☐ possess all required licenses for the work being bid
- ☐ limited liability corporation

The name, titles, and home addresses of all persons who are officers or partners in the organization are as follows:

Name: _____ Title: _____

Address: _____

Name: _____ Title: _____

Address: _____

Name: _____ Title: _____

Address: _____

Name: _____ Title: _____

Address: _____

Signed this _____ day of _____, 20_____

By: _____

Printed Name: _____

Title: _____

SECTION 00 45 19
NON-COLLUSION AFFIDAVIT OF PRIME BIDDER

State of _____)

) ss:

County of _____)

_____, being first duly sworn, deposes and says that:

They are the of _____ (Position) of _____ (Firm), the Bidder that has submitted the attached Bid;

They are fully informed with respect to the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid;

Such Bid is genuine and is not a collusive or sham bid;

Neither the Bidder nor any of its officers, partners, members, managers, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly, with any other Bidder, entity or person to submit a collusive or sham bid in connection with the Contract Documents for which the attached Bid has been submitted or to refrain from bidding in connection with the Contract Documents or has in any manner, directly or indirectly, sought by agreement, collusion, communication or conference with any other Bidder, entity or person to fix the price or prices in the attached Bid or that of any other Bidder or to fix any overhead, profit or cost element of the Bid price or the Bid price of any other Bidder or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against East Bay Charter Township, or any person or other entity interested in the proposed Contract Documents; and

The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees or parties having interest, including this affiant.

Name of Bidder: _____

Signed By: _____

Title: _____

Subscribed and sworn to me this _____ day of _____, 20_____.

_____ Notary Public

_____ County, Michigan

Acting in the County of: _____ __

Notary Seal

My Commission Expires: _____

SECTION 00 51 00
NOTICE OF AWARD

Attention: _____ Date: _____

Project: Grace MacDonald Park

Pursuant to the provisions of Article 1.11 of the Instructions to Bidders (Section 00 21 13), you are hereby notified that the _____ (Owner) during a _____ Meeting held on _____, _____, 20___ has directed the acceptance of your Bid for the above referenced Project in the amount of _____ Dollars ($_____).

This Project consists of: East Bay Township is seeking to improve Grace Macdonald Park with a number of improvements in 2026 and 2027. Contractor has choice of Spring 2026 or Fall 2026 construction. Please specify your preference for construction as Spring, Fall, or Both. as delineated in your Bid submitted to East Bay Charter Township on 02-10-2026.

Please comply with the following conditions within15 days of the date of this Notice of Award; that is by _____, 20_____.

Deliver to Landscape Architect _____ (_____) fully executed counterparts of the Agreement (Section 00 52 00) including all the Contract Documents.

Deliver with the executed Agreement the Contract Security (Bonds), on the form included in the Contract Documents, as specified in the General Conditions (Article 5, Section 00 72 00).

Deliver with the executed Agreement the Insurance Certificates (and other evidence of insurance) as specified in the General Conditions (Article 5, Section 00 72 00).

Please do not date Agreement and Contract Security (Bonds), as these will be dated by the Owner when executed by them.

It is important to comply with these conditions and time limits as failure to comply with these conditions within the time specified will entitle Owner to consider your bid abandoned, to annul this Notice of Award and to declare your Bid Security forfeited.

Within10 days after you comply with those conditions, Owner will return to you 2 fully signed counterparts of the Agreement with the Contract Documents attached.

In accordance with paragraph 2.05 of the General Conditions (Section 00 72 00), please submit to Landscape Architect the required schedules prior to the scheduling of a Pre-Construction Meeting.

Owner: _____

Authorized Signature: _____

Copy to Wade Trim

SECTION 00 52 00 - AGREEMENT

PART 1 GENERAL

1.01 SCOPE

A. This Agreement, made and entered into this _____ day of _____ in the year 20___, by and between East Bay Charter Township hereinafter called Owner, and _____ hereinafter called Contractor, in consideration of the mutual covenants hereinafter sent forth, agree as follows:

1.02 WORK

A. Contractor will complete the Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

East Bay Township is seeking to improve Grace Macdonald Park with a number of improvements in 2026. Contractor has choice of Spring 2026 or Fall 2026 construction. Bidders will specify a preference for construction as Spring, Fall, or either.

Base Bid: Construction of two concrete cornhole courts with adjoining ADA concrete walkway connections.

Alternate 1: Construction of an additional four concrete cornhole courts.

Alternate 2: Additional seating area and new fire pit and seatwall adjacent to the pavilion with new gas and electrical lines.

Alternate 3: A substitution of concrete pavement instead of pavers at the Alternate 2 fire pit area.

1.03 CONTRACT TIME

A. In the case of the contractor proposing Spring 2026 construction, the Work will be substantially completed on or before **05-22-2026**, and completed and ready for final payment in accordance with paragraph 14.11 of Section 00 72 00 - General Conditions on or before **06-05-2026.**

B. In the case of the contractor proposing Fall 2026 construction, the Work will be substantially completed on or before **10-31-2026**, and completed and ready for final payment in accordance with paragraph 14.11 of Section 00 72 00 - General Conditions on or before **11-14-2026**.

C.

D. Engineering and inspection costs incurred after the specified final completion date will be paid by the Contractorto the Ownerprior to final payment authorization.

1. Charges will be made at such times and in such amounts as the Landscape Architect will invoice the Owner, provided however said charges will be in accordance with the Landscape Architect's current rate schedule at the time the costs are incurred.

2. The costs of the Landscape Architect incurred after the specified final completion date will be deducted from the Contractor's progress payments.

E. Liquidated Damages.

1. Owner and Contractor recognize that time is of the essence of this Agreement and that the Owner will suffer financial loss if the Work is not Substantially Complete within the time specified in paragraph 1.03.A above, plus any extensions thereof allowed in accordance with Article 12 of Section 00 72 00. They also recognize the delays, expense and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by the Owner if the Work is not Substantially Complete on time. Accordingly, instead of requiring any such proof, the Owner and the Contractor agree that as liquidated damages for delay (but not as penalty) the Contractor will pay the Owner Five Hundred Dollars ($500.00) for each day that expires after the time specified in paragraph 1.03.A above for Substantial Completion until the Work is Substantially Complete.

2. Liquidated damages charged will be deducted from the Contractor's progress payment.

1.04 CONTRACT PRICE

A. Owner will pay Contractor as provided in the attached Proposal for performance of the Work in accordance with the Contract Documents.

1.05 PAYMENT PROCEDURES

A. Progress payments and retainage under this Contract are governed by the provisions of PA 1980, No. 524 (MCLA 125.1561 et seq.). That Act is incorporated herein by reference and made a part of this Contract. Without excluding any provisions of the Act from this Contract, but in order to comply therewith and summarize certain provisions, the following will apply:

1. Person representing the Contractor who will submit written requests for progress payments will be: _____

2. Person representing the Owner to whom requests for progress payments are to be submitted will be Beth Friend.

B. Contractor's representative, listed above, will submit Applications for Payment on the form provided in the Contract Documents in accordance with Article 14 of Section 00 72 00. Applications for Payment will be processed as provided in Section 00 72 00.

1.06 CONTRACTOR'S REPRESENTATIONS

A. In order to induce the Owner to enter into this Agreement, the Contractor makes the following representations:

1. Contractor has considered the nature and extent of the Contract Documents, Work, locality, and all local conditions and federal, state and local laws, and regulations that may affect cost, progress, performance, or furnishing of the Work.

2. Contractor has studied carefully all reports of investigations and tests of subsurface and latent physical conditions at the site or otherwise affecting cost, progress or performance of the Work which were relied upon in the preparation of the Plans and Specifications and which have been identified in the Supplementary Conditions (Section 00 73 00).

3. Contractor has made or caused to be made examinations, investigations and tests and studies of such reports and related data in addition to those referred to above as the Contractor deems necessary for the performance of the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract

Documents; and no additional examinations, investigations, tests, reports or similar data are or will be required by the Contractor for such purposes.

4. Contractor has correlated the results of such observations, examinations, investigations, tests, reports and data with the terms and conditions of the Contract Documents.

5. Contractor has given Landscape Architect written notice of conflicts, errors or discrepancies that Landscape Architect has discovered in the Contract documents and the written resolution thereof by Landscape Architect is acceptable to the Contractor.

1.07 CONTRACT DOCUMENTS

A. The Contract Documents which comprise the entire Contract between the Owner and the Contractor are attached to this Agreement, made a part hereof, and consists of the following:

1. Procurement Requirements (including the Advertisement for Bids, Instructions to Bidders, Proposal, Legal Status of Bidder, and other Documents listed in the Table of Contents thereof).

2. This Agreement

3. Performance and other Bonds

4. Notice of Award

5. Notice to Proceed (if issued)

6. Conditions of the Contract (including Section 00 72 00 - General Conditions and Section 00 73 00 - Supplementary Conditions, if any)

7. Specifications contained within Division 01 through 49 of the Project Manual

8. Plans bearing the following general title: Grace MacDonald Park

9. Addenda numbers _____ to _____, inclusive

10. Documentation submitted by the Contractor prior to Notice of Award

11. Any Modification, including Change Orders, duly delivered after execution of Agreement.

1.08 MISCELLANEOUS

A. Terms used in this Agreement which are defined in Article 1 of Section 00 72 00 will have the meanings indicated in Section 00 72 00.

B. No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on any other party without the written consent of the party sought to be bound; and specifically but without limitation, monies that may become due and monies that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

C. Owner and Contractor each binds them self, partners, successors, assigns and legal representatives to the other party hereto, their partners, successors, assigns and legal

representatives in respect to all covenants, agreements and obligations contained in the Contract Documents.

D. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon the Owner and the Contractor, who agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

IN WITNESS WHEREOF, THE PARTIES HERETO HAVE SIGNED THIS AGREEMENT IN _____ COUNTERPARTS. _____ COUNTERPART EACH HAS BEEN DELIVERED TO OWNER AND CONTRACTOR, AND ONE COUNTERPART HAS BEEN DELIVERED TO THE LANDSCAPE ARCHITECT. THE CONTRACT DOCUMENTS HAVE BEEN SIGNED OR IDENTIFIED BY OWNER AND CONTRACTOR.

THIS AGREEMENT WILL BE EFFECTIVE ON _____, 20____.

OWNER: EAST BAY CHARTER TOWNSHIP

BY: _____

AUTHORIZED SIGNATURE: _____

ATTEST: _____

ADDRESS FOR GIVING NOTICES:

_____

_____

_____

CONTRACTOR: _____

BY: _____

AUTHORIZED SIGNATURE: _____

ATTEST: _____

ADDRESS FOR GIVING NOTICES:

_____

_____

_____

LICENSE NO. _____

AGENT FOR SERVICE OF PROCESS: _____

SECTION 00 55 00
NOTICE TO PROCEED

To: _____ Date: _____, 20_____

_____

Attention: _____

Project: Grace MacDonald Park

Please note that the Contract Time under the above Contract will commence to run on _____, 20___. Within **ten (10)** days of this date you are to start performing the Work. The dates of Substantial Completion and Final Completion are set forth in the Agreement: they are _____, and _____, respectively.

The following conditions must be met by Contractor:

In accordance with Article 2.05 of Section 00 72 00 - General Conditions, please submit to the Landscape Architect the required Schedules prior to the scheduling of a Pre-Construction Meeting.

In accordance with Article 2.05 of Section 00 72 00 - General Conditions, please request a Pre-Construction Meeting from the Landscape Architect prior to delivery of any materials or start of any construction.

Notify the Landscape Architect a minimum of **three (3)** full working days' notice to schedule a Pre-Construction Meeting.

Work at the site must be started by _____, 20_____.

Owner: _____

Authorized Signature: _____

COPY TO Wade Trim

SECTION 00 60 00 - PROJECT FORMS

PART 1 GENERAL

1.01 AVAILABLE FORMS

A. The following Project Forms are available for use by Owner, Contractor and/or Landscape Architect for this project and are located in Exhibit 1of the Contract Documents:

1. Certificate of Substantial Completion
2. Construction Change Requisition / Work Change Directive
3. Field Order
4. Final Inspection Request
5. Non-Compliance Notice / Order to Remove Defective Work
6. Open Items List
7. Punch List Items
8. Request for Information
9. Warranty Data Sheet

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 00 61 12.13
LABOR AND MATERIAL PAYMENT BOND FORM

Bond No. _____

KNOW ALL BY THESE PRESENT, That we, _____, a corporation organized and existing under the laws of the State of, and duly authorized to transact business in the State of Michigan, hereinafter called the “Principal,” and _____, a corporation organized and existing under the laws of the State of _____, and duly authorized to transact business in the State of Michigan, as Surety, hereinafter called “Surety”, are held and firmly bound unto _____, as Obligee, and hereinafter called “Obligee,” in the just and full sum of _____Dollars ($_____) lawful money of the United States of America, to be paid to the said Obligee, to which payment well and truly to be made, we bind ourselves, our heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION is such that, WHEREAS, the above Principal has entered into a contract with the said Obligee, dated the day of _____, 20_____, for _____

_____.

Herein referred to and made a part hereof as fully and to the same extent as if the same were entirely written herein, and

WHEREAS, it was one of the conditions of the award of the said Obligee, pursuant to which said contract was entered into, that these presents should be executed.

AND WHEREAS, this Bond is given in compliance with and subject to the provisions of Act No. 213 of the Public Acts of Michigan for the year 1963, as amended, including all notices, time limitation provisions and other requirements set forth therein, which are incorporated herein by reference.

AND THE SAID SURETY, for value received, hereby stipulates and agrees that no change, extension of time, or any other forbearance, alteration or addition to the terms of the contract or to the Work to be performed thereunder or the Contract Documents accompanying the same will in anywise affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, or any other forbearance, alteration or addition to the terms of the contract or to the Work or to the Contract Documents.

NOW, THEREFORE, the condition of this obligation is such that if all claimants as defined in Act No. 213 of the Public Acts of Michigan for the year 1963, as amended, are timely paid for all labor and material used or reasonably required for use in the performance of the contract, then this obligation will be void; otherwise, it will remain in full force and effect.

Signed and sealed this day of _____, 20_____.

Signed, sealed and delivered in the presence of:

Witness for Contractor: _____

_____ (Principal)

_____ (Title)

By: _____

Witness for Surety: _____

_____ (Surety)

_____ (Title)

By: _____

_____ (Attorney-in-Fact) Seal

Address of Surety: _____

Telephone: _____

SECTION 00 61 13.13
PERFORMANCE BOND FORM

Bond No. _____

KNOW ALL BY THESE PRESENT, That we, _____, a corporation organized and existing under the laws of the State of, and duly authorized to transact business in the State of Michigan, hereinafter called the “Principal,” and _____, a corporation organized and existing under the laws of the State of _____, and duly authorized to transact business in the State of Michigan, as Surety, hereinafter called “Surety”, are held and firmly bound unto _____, as Obligee, and hereinafter called “Obligee,” in the just and full sum of _____ Dollars ($_____) lawful money of the United States of America, to be paid to the said Obligee, to which payment well and truly to be made, we bind ourselves, our heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION is such that, WHEREAS, the above Principal has entered into a contract with the said Obligee, dated the day of _____, 20_____, for _____

_____.

Herein referred to and made a part hereof as fully and to the same extent as if the same were entirely written herein, and

WHEREAS, it was one of the conditions of the award of the said Obligee, pursuant to which said contract was entered into, that these presents should be executed.

AND THE SAID SURETY, for value received, hereby stipulates and agrees that no change, extension of time, or any other forbearance, alteration or addition to the terms of the contract or to the work to be performed thereunder or the Contract Documents accompanying the same will in anywise affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, or any other forbearance, alteration or addition to the terms of the contract or to the Work or to the Contract Documents.

NOW, THEREFORE, if the above Principal will in all respects comply with the terms and conditions of said contract, and their obligations thereunder, including the Contract Documents therein referred to and made a part thereof, and such alteration as may be made in such contract or Contract Documents, as herein or therein provided for, then this obligation will be void; otherwise, this bond and obligation will be and remain in full force and effect.

Signed and sealed this day of _____, 20_____.

Signed, sealed and delivered in the presence of:

Witness for Contractor: _____

_____ (Principal)

_____ (Title)

By: _____

Witness for Surety: _____

_____ (Surety)

_____ (Title)

By: _____

_____ (Attorney-in-Fact) Seal

Address of Surety: _____

Telephone: _____

SECTION 00 61 19.13
MAINTENANCE AND GUARANTEE BOND FORM

Bond No. _____

KNOW ALL BY THESE PRESENT, That we, _____, a corporation organized and existing under the laws of the State of, and duly authorized to transact business in the State of Michigan, hereinafter called the “Principal,” and _____, a corporation organized and existing under the laws of the State of _____, and duly authorized to transact business in the State of Michigan, as Surety, hereinafter called “Surety”, are held and firmly bound unto _____, as Obligee, and hereinafter called “Obligee,” in the just and full sum of _____ Dollars ($_____) lawful money of the United States of America, to be paid to the said Obligee, to which payment well and truly to be made, we bind ourselves, our heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION is such that, WHEREAS, the above Principal has entered into a contract with the said Obligee, dated the day of _____, 20_____, for _____

_____

_____

Herein referred to and made part hereof as fully and to the same extent as if the same were entirely written herein, and

NOW THEREFORE, the condition of this obligation is that under the Contract Documents, Contractor has agreed with Owner that for a period of one (1) year from the date of payment of the Final Estimate, Contractor will keep in good order and repair any defect in the Work, either by Contractor or its Subcontractors that may develop or be discovered during said one (1) year period due to improper materials, defective equipment, workmanship, or arrangements and any other work affected in making good such imperfections. Contractor also agreed to promptly make such repairs as directed by Owner for replacement of the Work, without cost to Owner, except for such parts of the Work as may have been disturbed without the consent of Contractor after the final acceptance of the Work, whenever directed so to do by notice from Owner. If Contractor fails to make such repair within one (1) week from the date of receipt of such notice, then Owner will have the right to purchase such materials and employ such labor and equipment as may be necessary for the purpose and to undertake, to and make such repairs and charge the cost thereof to Contractor and receive payment for the same promptly from the Contractor or Surety.

If any repair is necessary to be immediately made to protect persons or property then, and in such event, Owner may, but will not be required to, take immediate steps to repair such defects without notice to Contractor. In such event, Owner will not be required to obtain the lowest bid for the performance of the Work or any part thereof, and all sums actually paid therefore will be charged to the Contractor or Surety. In this regard, the judgment of Owner will be final and conclusive. Contractor will, for a period of one (1) year from the date of payment of the Final Estimate, keep the Work in good order and repair, except for such parts of the Work which may have been disturbed without the consent of Contractor after the final acceptance of the Work. Contractor will further, whenever notice is given as hereinbefore specified, promptly proceed to make the repair as in said notice directed or reimburse Owner for any cost incurred by Owner in making such repairs.

If Contractor or Surety fail to do as hereinbefore specified, they will jointly and severally indemnity, defend, and hold harmless Owner from and against all and any losses, costs, suits, and actions for damages of every kind and description brought or claimed against Owner for or on account of any injury or damage to persons or property received or sustained by any party or parties by or from any of the acts of omissions or through the negligence of Contractor, its Subcontractors, Suppliers, servants, agents, or employees in connection with the Work and then from any and all claims arising under the Workmen’s Compensation Act of the State of Michigan.

IN WITNESS WHEREOF, the parties hereto have caused this Maintenance and Guarantee Bond to be executed by their respective authorized officers this _____, 20_____.

Signed, sealed and delivered in the presence of:

Witness for Contractor: _____

_____ (Principal)

_____ (Title)

By: _____

Witness for Surety: _____

_____ (Surety)

_____ (Title)

By: _____

_____ (Attorney-in-Fact) Seal

Address of Surety: _____

Telephone: _____

SECTION 00 62 75
ENGINEER'S CERTIFICATE FOR PAYMENT

Job Number: _____ Certificate Number: _____ Date: _____

Owner: _____ Contractor: _____

Project: _____

Contract Date: _____

Substantial Completion: _____ Extended To: _____

Final Completion: _____ Extended To: _____

****

Original Contract Price: _____ Total Earned To Date: _____

Adjustments to Quantities: _____ Retention: _____

Extras: _____ Deductions: _____

Total Change Orders: _____ Total Withheld: _____

Amended Contract Price: _____ Total Net Due: _____

Less Total Net Due: _____ Less Previous Certificates: _____

Balance on Contract: _____ Balance Due This Certificate: _____

****

ENGINEER'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on the data comprising the above application, the Landscape Architect to the best of Landscape Architect's knowledge, information, and belief and subject to the limitations stated in the Contract Documents certifies to the Owner that: (1) Work has progressed to the point indicated, (2) that the quality of the Work is in accordance with the Contract Documents, and (3) Contractor is entitled to payment of the TBalance Due This Certificate.

Certified By: _____ Date: _____

SECTION 00 62 76
CONTRACTOR'S APPLICATION FOR PAYMENT

Job Number: _____ Application No: _____ Date: _____

Owner: _____ Contractor: _____

Project: _____

Contract Date: _____

Period of this Application: _____ to _____ _____ _____

****

Total Earned To Date: _____ Less Total Earned to Due: _____

Previous Certificate: _____ Total Earned this Application: _____

CONTRACTOR'S CERTIFICATION

The undersigned Contractor certifies that to the best of Contractor's knowledge, information, and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by Contractor for Work for which previous Certificates for Payment were issued and payments received from Owner, and that current payment shows herein is now due.

By: _____ Title: _____

CONTRACTOR'S DECLARATION

I hereby declare that I have not, during the period covered by this Application, performed any work, furnished any material, sustained any loss, damage, or delay for any reason, including soil conditions encountered or created, or otherwise done anything for which I will ask, demand, sue for, or claim compensation from the Owner or its agents, and the Landscape Architect or its agents, in addition to the regular items set forth in the Contract as dated above executed between myself and the Owner and in the Change Orders for Work issued by the Owner in writing as provided thereunder, except as I hereby make claim for additional compensation and/or extension of time, as set forth on the itemized statement attached hereto.

By: _____ Title: _____

SECTION 00 62 77
PAYMENT SCHEDULE

Application No.: _____ Date: _____Period: _____

Item of Work	Unit	Original Estimated Quantity	Unit Price	Period Quantity	Period Amount	Total Quantity to Date	Total Amount to Date

SECTION 00 63 25
SUBSTITUTION REQUEST FORM

Specification Section: _____

Specified Product: _____

Proposed Substitution: _____

Does specified product exceed, in any respect proposed substitution?	___Y	___N
Does substitution affect dimensions shown on Plans?	___Y	___N
Does substitution affect other trades more than original product?	___Y	___N
Does warranty differ from that specified?	___Y	___N
Does substitution affect cost to Owner?	___Y	___N
Does substitution result in any license fee or royalty?	___Y	___N

If you indicated "Yes" to any of the items above, attach thorough explanation on your Company letterhead, as follows:

Explain any differences between proposed substitution and specified product.

Summarize experience with product and manufacturer in Project area.

Attach complete technical data and literature.

The undersigned states that the function, appearance, and quality of the proposed substitution is equivalent or superior to the specified item, and that all information above and attached is true and correct.

Submitted By: _____

Signature: _____ Date: _____

Position: _____ Company: _____

Address: _____

Telephone: _____ Email: _____

SECTION 00 63 70
CHANGE PROPOSAL FORM

Project: _____ Date: _____ _

Contractor: _____

Owner: _____ _

This Change Proposal is submitted in accordance with paragraph 10.06 of Section 00 72 00 - General Conditions. If this Change Proposal is accepted, either in whole or in part, a Change Order will be issued to modify the Contract Documents accordingly.

Detailed Description of Proposed Change	
____	
Attachments (List documents attached supporting requested change)	
____	
____	
____	
Change in Contract Price	**Change in Contract Time**
Original Contract Price:$____	Original Contract Time: Substantial Completion: MM-DD-YYYY Final Completion: MM-DD-YYYY
Increase or Decrease from previously approved Change Order(s): $_____	Increase or Decrease from previously approved Change Order(s): Substantial Completion: MM-DD-YYYY Final Completion: MM-DD-YYYY
Contract Price prior to this Change Proposal: $____	Contract Time prior to this Change Proposal: Substantial Completion: MM-DD-YYYY Final Completion: MM-DD-YYYY
Increase or Decrease of this Change Proposal: $____	Increase or Decrease of this Change Proposal: Substantial Completion: MM-DD-YYYY Final Completion (days): MM-DD-YYYY
Contract Price incorporating this Change Proposal: $____	Contract Time incorporating this Change Proposal: Substantial Completion: MM-DD-YYYY Final Completion: MM-DD-YYYY
Landscape Architect's Decision on Change Proposal	
____	

Contractor:	Landscape Architect:	Owner:
By: _____	By: _____	By: _____ ___
Date: _____	Date: _____	Date: _____

SECTION 00 65 16
CERTIFICATE OF SUBSTANTIAL COMPLETION

Project: Grace MacDonald Park

Owner: East Bay Charter Township

Contractor: _____

Contract Date: _____ Project No.: _____

Date of Issuance: _____

Project or Designated Portion will include: _____

The Work performed under this Contract has been reviewed and found to be Substantially Complete. The _____ which is also the date of commencement of applicable warranties required by the Contract Documents except as stated below. date of Substantial Completion of the Project or portion thereof designated above is hereby established as: _____

DEFINITION OF DATE OF SUBSTANTIAL COMPLETION

The date of Substantial Completion of the Work or designated portion thereof, is the date certified by the Landscape Architect when construction is sufficiently complete, in accordance with the Contract Documents, so the Owner can occupy or utilize the Work or designated portion thereof for the use for which it is intended, as expressed in the Contract Documents.

A list of items to be completed or corrected, prepared by the Landscape Architect is attached hereto. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. The date of commencement of warranties for items on the attached list will be the date of final payment unless otherwise agreed to in writing.

The responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to the Work and insurance will be as follows:

_____

Owner will have **45** calendar days after receipt of this certificate during which Owner may make written objection to Landscape Architect and Contractor as to any provisions of the certificate or attached list. Such objection may be cause for this Certificate of Substantial Completion to be null and void.

Landscape Architect:

_____

By: _____

Date: _____

SECTION 00 65 20
SWORN STATEMENT

State of Michigan

County of _____}

being duly sworn, deposes and says:

That _____ is the (Contractor) (Subcontractor) for an improvement to the following described real property situated in _____ County, Michigan described as follows:

Insert Legal Description of Property

That the following is a statement of each Subcontractor and Supplier and laborer, for which the payment of wages or fringe benefits and withholdings is due but unpaid, with whom the (Contractor) (Subcontractor) has (contracted) (subcontracted) for performance under the contract with the Owner or lessee thereof, and that the amounts due to the persons as of the date hereof are correctly and fully set forth opposite their names, as follows:

Name of Subcontractor/ Supplier/ Laborer	Type of Improvement Furnished	Total Contract Price	Amount Already Paid	Amount Currently Owing	Balance to Complete (optional)	Amount of Laborer Wages Due but Unpaid	Amount of Laborer Fringe Benefits and Withholdings Due But Unpaid
TOTALS:							

(Some columns are not applicable to all persons listed)

Contractor has not procured material from, or subcontracted with, any person other than those set forth on the reverse side and owes no money for the improvement other than the sums set forth on the reverse side.

Deponent further says that they make the foregoing statement as the (Contractor) (Subcontractor) or as _____ of the (Contractor) (Subcontractor) for the purpose of representing to the Owner or lessee of the described on the reverse side premises and their agents that the property described on the reverse side is free from claims of construction liens, or the possibility of construction liens, except as specifically set forth on the reverse side and except for claims of construction liens by laborers which may be provided pursuant to Section 109 of the Construction Lien Act, Act No. 497 of the Public Acts of 1980, as amended, being section 570.1109 of the Michigan Compiled Laws.

Warning to Owner: Owner or Lessee of the property described herein may not relay on this Sworn Statement to avoid claim of a Subcontractor, supplier or laborer who has provided a Notice of Furnishing pursuant to Section 109 of the Construction Lien Act to the Designee or to the Owner or Lessee if the Designee is not named or has died.

Warning to Deponent: A person, who with intent to defraud, gives a false Sworn Statement, is subject to criminal penalties as provided in Section 110 of the Construction Lien Act, Act No. 497 of the PUblic Acts of 1980, as amended, being Section 570.1110 of the Michigan Complied Laws.

_____ day of _____, 20____.

Notary Public: _____

_____ County, Michigan

My Commission Expires: _____

INSTRUCTIONS

A Sworn Statement in the preceding form must be provided before any Contractor or Subcontractor can file a Complaint, Cross-Claim, or Counter-Claim to enforce a construction lien.

An Owner or lessee may withhold payment to a Contractor or Subcontractor who has not provided a Sworn Statement. Owner or lessee may withhold from a Contractor or Subcontractor who has provided a Sworn Statement the amount sufficient to pay all sums shown on the statement as owing Subcontractors, Suppliers, and laborers, or the amount shown to be due to lien claimants who have provided Notices of Furnishing pursuant to the Construction Lien Act of 1980.

Owner or lessee may rely on a Sworn Statement to avoid a lien claim unless the lien claimant has provided the Owner or lessee with a Notice of Furnishing pursuant to the Construction Lien Act of 1980.

If the contract provides for payments by the Owner to the Contractor, if any, in the normal course of construction, but the Owner elects to pay lien claimants directly, the first time the Owner elects to make payment directly to a lien claimant they will provide at least 5 business days' notice to the Contractor of the intention to make direct payment. Subsequent direct disbursements to lien claimants need not be preceded by the 5-day notice provided in this section unless the Owner first returns to the practice of paying all sums to the Contractor.

SECTION 00 72 00 - GENERAL CONDITIONS

ARTICLE 1 DEFINITIONS

1.01 DEFINED TERMS

A. Wherever used in these General Conditions or in the other Contract Documents, the following terms have the meanings indicated which are applicable to both the singular and plural thereof:

1. Addenda -- Written or graphic instruments issued prior to the opening of Bids which clarify, correct or change the Contract Documents.

2. Agreement -- The written Agreement between Owner and Contractor covering the Work to be performed; other Contract Documents are attached to the Agreement and made a part thereof as provided therein.

3. Application and Certificate for Payment -- The form included in the Contract Documents which is to be used by Contractor in requesting progress or final payment and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. Bid -- The offer or proposal of the bidder submitted on the prescribed form setting forth the price(s) for the Work to be performed.

5. Bidding Requirements -- The Advertisement for Bids, Instructions to Bidders, Supplementary Instructions to Bidders, Proposal, Legal Status of Bidder, Bid Bond, and any other documents identified in the Proposal, to be submitted with the Bid.

6. Bonds -- Bid, Performance and Payment bonds and other instruments of security.

7. Change Order -- A written order to Contractor, reviewed by Landscape Architect and signed by Owner, issued after execution of the Contract, authorizing a change in the Work or an adjustment in the Contract Price or the Contract Time. The Contract Price and Contract Time may be changed only by Change Order. A Change Order signed by Contractor indicates Contractor's agreement therewith, including that the Change Order constitutes a final adjustment in the Contract Price or Contract Time for all issues addressed or described in the Change Order.

8. Change Proposal -- A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Landscape Architect concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.

9. Claims --

   a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by Landscape Architect concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Landscape Architect’s decision regarding a Change Proposal; seeking resolution of a contractual issue that Landscape Architect

has declined to address; or seeking other relief with respect to the terms of the Contract.

b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Landscape Architect's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Landscape Architect has declined to address.

c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, arising after Landscape Architect has issued a recommendation of final payment.

d. A demand for money or services by a third party is not a Claim.

10. Constituents of Concern -- Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

11. Contract -- The entire and integrated written contract between Owner and Contractor concerning the Work.

12. Contract Documents -- Those items so designated in the Agreement, and which together comprise the Contract.

13. Contract Price -- The monies or other considerations payable by Owner to Contractor for completion of acceptable Work in accordance with the Contract Documents as stated in the Agreement.

14. Contract Time -- The number of days or the date stated in the Agreement:

    a. to achieve Substantial Completion of all or any specified portions of the Work, and;

    b. to complete the Work so that it is ready for final payment as evidenced by Landscape Architect's written recommendation of final payment in accordance with paragraph 14.11.

15. Contractor -- The person, firm or corporation with whom Owner has entered into the Agreement.

16. Cost of the Work -- The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined in paragraph 12.01.

17. Day -- A calendar day of 24 hours measured from midnight to the next midnight.

18. Defective -- An adjective which when modifying the word Work refers to Work that is unsatisfactory, faulty or deficient, in that it does not conform to the Contract Documents or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or has been damaged prior to Landscape Architect's recommendation of final payment.

19. Drawings -- See Plans.

20. Effective Date of Agreement -- The date indicated in the Agreement on which it becomes effective, but if no such date is indicated it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

21. Electronic Document -- Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.

22. Electronic Means -- Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow:

    a. the transmission or communication of Electronic Documents;

    b. the documentation of transmissions, including sending and receipt;

    c. printing of the transmitted Electronic Document by the recipient;

    d. the storage and archiving of the Electronic Document by sender and recipient; and

    e. the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

23. Landscape Architect -- The person, firm, or corporation identified in the Supplementary Instructions to Bidders hired by Owner to prepare Plans and Specifications for the Project and to assist Owner in interpreting Plans and Specifications during the performance of the Work. Landscape Architect's authority and responsibility are set forth in the Contract between Owner and Landscape Architect. Contractor acknowledges and agrees that Landscape Architect's obligations and duties under Landscape Architect's contract with Owner are obligations and duties to Owner only, and Landscape Architect has no independent obligation to Contractor of any kind, including but not limited to providing services, or to take any action or to refrain from taking action on behalf of Contractor or any Subcontractor, Sub-Subcontractor or Supplier.

24. Field Order -- A written order issued by Landscape Architect which clarifies or interprets the Contract Documents or orders minor changes in the Work in accordance with paragraph 9.04 and paragraph 9.05 but which does not involve a change in the Contract Price or the Contract Time.

25. Hazardous Environmental Conditions -- The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.

    a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.

    b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.

    c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.

26. Laws and Regulations; Laws or Regulations -- Any and all applicable laws, rules, regulations, ordinances, codes and orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction.

27. Lump Sum -- Construction Work where Owner pays a single stipulate price (Lump Sum) for the entire scope of Work; plus or minus alternates and/or allowances. However, unit prices may be required for individual items of Work for the purposes of changes, additions, or deletions.

28. Milestone -- A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of the Work.

29. Notice of Award -- The written notice by Owner to the apparent successful Bidder stating that, upon compliance by the apparent successful Bidder with the conditions precedent enumerated therein, within the time specified, Owner will sign and deliver the Agreement.

30. Notice to Proceed -- A written notice given by Owner to Contractor (with a copy to Landscape Architect) fixing the date on which the Contract Time will commence to run and on which Contractor will start to perform Contractor's obligation under the Contract Documents.

31. Owner -- The public body or authority, corporation, limited liability company, association, partnership, or individual with whom Contractor has entered into the Agreement and for whom the Work is to be provided and as identified in the Supplementary Instructions to Bidders.

32. Partial Utilization -- Use by Owner of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

33. Plans -- The part of the Contract Documents which graphically show the extent, character and Scope of the Work to be furnished and performed by Contractor and which have been prepared or approved by Landscape Architect or Owner; sometimes also referred to as Drawings.

34. Progress Schedule -- A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor’s plan to accomplish the Work within the Contract Times.

35. Project -- The total construction of which the Work to be provided under the Contract Documents may be the whole or a part as indicated elsewhere in the Contract Documents.

36. Project Manual -- The volume assembled for the Project which may include, among other parts, Procurement Requirements, Contracting Requirements and Specifications.

37. Proposal -- The offer or bid of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

38. Radioactive Material -- Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 as amended.

39. Resident Project Representative -- The authorized representative of Landscape Architect who may be assigned to the Site or any part thereof.

40. Samples -- Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

41. Schedule of Submittals -- A schedule, prepared and maintained by Contractor, of required Submittals and the time requirements for Landscape Architect's review of the Submittals.

42. Schedule of Values -- A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

43. Shop Drawings -- All drawings, diagrams, illustrations, schedules and other data or information required by the Contract Documents which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate material or equipment for some portion of the Work.

44. Site -- Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.

45. Specifications -- That part of the Contract Documents which consist of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.

46. Subcontractor -- An individual, firm or corporation having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

47. Submittal -- A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Landscape Architect, or that is indicated as a Submittal in the Schedule of Submittals accepted by Landscape Architect. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers' instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.

48. Substantial Completion -- The Work (or a specified part thereof) has progressed to the point where, in the opinion of Landscape Architect as evidenced by the Certificate of Substantial Completion, it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it was intended; or if no such certificate is issued, when the Work is complete and ready for final payment as evidenced by Landscape Architect's written recommendation of final payment in accordance with paragraph 14.11. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

49. Supplementary Conditions -- The part of the Contract Documents which amends or supplements these General Conditions.

50. Supplementary Instructions to Bidders -- The part of the Contract Documents which amends or supplements the Instructions to Bidders.

51. Supplier -- A manufacturer, fabricator, supplier, distributor, material man, or vendor having a direct contract with Contractor, or with any Subcontractor, or with Owner, to furnish materials or equipment to be incorporated in the Work by Contractor or any Subcontractor.

52. Unit Price -- Construction Work where Owner pays a fixed sum (Unit Price) per each completed unit of Work. Units are listed on the Proposal Form.

53. Utilities – Underground or above ground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments, and any structures or encasements containing such facilities, which have been installed to furnish any of the following services or materials: electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems, water or other liquids or chemicals.

54. Work -- The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work includes and is the result of performing or furnishing labor and furnishing and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing documents, all as required by the Contract Documents.

55. Work Change Directive -- A written directive to Contractor, issued on or after the Effective Date of the Agreement and signed by Owner and reviewed by Landscape Architect, ordering an addition, deletion or revision in the Work, or responding to differing or unforeseen physical conditions under which the Work is to be performed as provided in paragraph 4.03 or to emergencies under paragraph 6.18. A Work Change Directive will not change the Contract Price or Contract Time but is evidence that the parties expect that the change directed or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Time as provided in paragraph 10.01.

1.02 TERMINOLOGY

A. The following words, terms, or phrases are not defined but, when used in the Contract Documents, have the following meaning:

1. Whenever in the Contract Documents the terms “as ordered,” “as directed,” “as required,” “as allowed,” “as approved” or terms of like effect or import are used; or the adjectives “reasonable,” “suitable,” “acceptable,” “proper” or “satisfactory” or adjectives of like effect or import are used to describe a requirement, direction, review or judgment of Landscape Architect as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate, in general, the completed Work for compliance with the technical requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective will not be effective to assign to Landscape Architect any duty or authority to supervise or direct the furnishing or performance of the Work or any

duty or authority to undertake responsibility contrary to the provisions of paragraph 9.10 or any other provision of the Contract Documents.

2. The word “furnish,” when used in connection with services, materials, or equipment, will mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

3. The word “install,” when used in connection with services, materials, or equipment, will mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

4. The words “perform” or “provide,” when used in connection with services, materials, or equipment, will mean to furnish and install said services, materials, or equipment complete and ready for intended use.

5. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied.

B. Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 PRELIMINARY MATTERS

2.01 DELIVERY OF BONDS AND INSURANCE

A. When Contractor delivers the executed Agreement to Owner, Contractor will also deliver to Owner such Bonds and Insurance Certificates and other evidence of Insurance requested as Contractor may be required to furnish in accordance with Article 5. No Work at the site may begin or progress payments made to Contractor until all Bonds and Insurance Certificates in the form and substance required in Article 5 have been submitted and approved by Owner.

2.02 COPIES OF DOCUMENTS

A. Owner will furnish to Contractor up to five (5) copies of the Contract Documents (including at least one fully signed counterpart of the Agreement) as are reasonably necessary for the execution of the Work. Additional copies will be furnished, upon request, at the cost of reproduction.

2.03 COMMENCEMENT OF CONTRACT TIME; NOTICE TO PROCEED

A. Time is of the essence in the performance of the Work. The Contract Time will commence to run on the 30th day after the effective date of the Agreement, or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the effective date of the Agreement. In no event will the Contract Time commence to run later than the 30th day after the effective date of the Agreement. Time limits stated in the Contract Documents are of the essence of the Agreement.

2.04 STARTING THE PROJECT

A. Contractor will start to perform the Work within 10 days of when the Contract Time commences to run, but no Work will be done at the Site prior to the date on which the Contract Time

commences to run. Contractor will notify Landscape Architect at least 3 working days in advance of the time Contractor intends to start Work.

2.05 PRECONSTRUCTION MEETING

A. Within 10 days of the Effective Date of the Agreement and prior to the delivery of materials or the start of any construction, Contractor will request a Preconstruction Meeting from Landscape Architect. A minimum of 3 full working days' notice will be required.

B. Prior to the scheduling of the Preconstruction Meeting, Contractor will submit to Landscape Architect for review:

1. A preliminary Progress Schedule indicating the starting and completion dates of the various stages of the Work, including any Milestones specified in the Contract Documents;

2. A preliminary Schedule of Submittals which will list each required Submittal and the times for submitting, reviewing and processing such Submittal;

3. An estimated monthly payment schedule, and a preliminary Schedule of Values for all of the Work.

C. The Preconstruction Meeting will be held for review and acceptance of the schedules, to establish procedures for handling Shop Drawings and other Submittals, for processing Applications for Payment, and to establish a working understanding among the parties as to the Work.

2.06 ELECTRONIC TRANSMITTALS

A. Except as otherwise stated elsewhere in the Contract, Owner, Landscape Architect, and Contractor may send, and will accept, Electronic Documents transmitted by Electronic Means.

B. If the Contract does not establish protocols for Electronic Means, then Owner, Landscape Architect, and Contractor will jointly develop such protocols.

C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient’s use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

ARTICLE 3 CONTRACT DOCUMENTS INTENT AND REUSE

3.01 INTENT

A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents.

C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.

D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

E. Landscape Architect will issue clarifications and interpretations of the Contract Documents as provided herein.

F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

G. Nothing in the Contract Documents creates:

1. any contractual relationship between Owner or Landscape Architect and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or

2. any obligation on the part of Owner or Landscape Architect to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations; or

3. any obligation on the part of Landscape Architect to Contractor.

3.02 REFERENCE TO STANDARDS AND SPECIFICATIONS OF TECHNICAL SOCIETIES

A. Reference to standards, specifications, manuals or codes of any technical society, organization or association, or to the Laws or Regulations of any governmental authority, whether such reference be specific or by implication, will mean the latest standard, specification, manual, or Laws or Regulations in effect at the time of opening of Bids or, on the effective date of the Agreement if there were no Bids, except as may be otherwise specifically stated in the Contract Documents.

B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any Work, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be furnished and performed whether or not it is specifically called for.

C. No provision of any standard, specification, manual, code or instruction will be effective to change the duties and responsibilities of Owner, Contractor or Landscape Architect, or any of their Subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor will it be effective to assign to Owner, Landscape Architect or any of Landscape Architect's consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of paragraph 9.10 or any other provision of the Contract Documents.

3.03 REPORTING AND RESOLVING DISCREPANCIES

A. Before undertaking each part of the Work, Contractor will carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor has a duty to and will promptly report in writing to Landscape

Architect any conflict, error, ambiguity, or discrepancy which Contractor should reasonably have discovered and will obtain a written interpretation or clarification from Landscape Architect before proceeding with any Work affected thereby.

B. If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, Contractor will report it to Landscape Architect in writing at once, and, Contractor will not proceed with the Work affected thereby (except in an emergency as authorized by paragraph 6.18) until receiving written instruction or clarification from Landscape Architect or Owner. However, Contractor will not be liable to Owner or Landscape Architect for failure to report any such conflict, error, ambiguity or discrepancy unless Contractor knew or reasonably should have known thereof.

C. Except as otherwise specifically stated in the Contract Documents or as may be provided by amendment or supplement issued by one of the methods indicated in paragraph 3.05, the provisions of the Contract Documents will take precedence in resolving any conflict, error, ambiguity or discrepancy between the provisions of the Contract Documents and;

1. the provisions of any standard, specification, manual, code or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

2. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 REQUIREMENTS OF CONTRACT DOCUMENTS

A. During the performance of the Work and until final payment, Contractor and Owner will submit to Landscape Architect in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation - RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Landscape Architect will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.

B. Landscape Architect will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Landscape Architect’s written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve

1. the performance or acceptability of the Work under the Contract Documents,

2. the design (as set forth in the Drawings, Specifications, or otherwise), or

3. other engineering or technical matters, then Landscape Architect will promptly notify Owner and Contractor in writing that Landscape Architect is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in paragraph 11.01.

3.05 ORDER OF PRECEDENCE

A. In resolving conflicts, errors or discrepancies between Plans and Specifications,

1. Figured dimensions will govern over scaled dimensions;

2. Plans will govern over Reference Standards;

3. Project Specifications will govern over Reference Standards and Plans.

3.06 AMENDING AND SUPPLEMENTING CONTRACT DOCUMENTS

A. The Contract Documents may be amended to provide for additions, deletions and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways:

1. a Field Order (pursuant to paragraph 9.05), or,

2. a Change Order (pursuant to paragraph 10.01.A.1), or

3. a Work Change Directive Order (pursuant to paragraph 10.01.A.2)

B. In addition, the requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, in one or more of the following ways:

1. a Field Order (pursuant to paragraph 9.05),

2. Landscape Architect’s review of a Shop Drawing or Sample (pursuant to paragraph 6.21), or

3. Landscape Architect’s written interpretation or clarification (pursuant to paragraph 9.04).

3.07 REUSE OF DOCUMENTS

A. Neither Contractor nor any Subcontractor, manufacturer, fabricator, Supplier, distributor, or other person or organization performing or furnishing any of the Work under a direct or indirect contract with Owner:

1. will have or acquire any title to or ownership rights in any of the Plans, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Landscape Architect or Landscape Architect’s Consultant, and

2. they will not reuse any of such Plans, Specification, other documents or copies on extensions of the Project or any other project without written consent of Owner and Landscape Architect and specific written verification or adaptation by Landscape Architect.

3.08 ELECTRONIC DATA

A. Except as otherwise stated elsewhere in the Contract Documents, Owner, Landscape Architect and Contractor may transmit, and will accept, Project-related correspondence, text, data, documents, drawings, information and graphics, including but not limited to Shop Drawings and other Submittals, in electronic media or digital format, either directly or through access to a secure Project website.

B. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting

from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS

4.01 AVAILABILITY OF LANDS

A. Owner will furnish, as indicated in the Contract Documents and not later than the established date for beginning Work on the Contract, the lands upon which the Work is to be performed, rights of way and easements for access thereto, and such other lands which are designated for the use of Contractor. Owner will identify any encumbrances or restrictions not of general application but specifically related to use of lands so furnished with which Contractor will have to comply in performing the Work. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by Owner, unless otherwise provided in the Contract Documents. Contractor will provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment unless otherwise provided in the Contract Documents.

4.02 SUBSURFACE AND PHYSICAL CONDITIONS; INVESTIGATIONS AND REPORTS

A. Reference is made to the Supplementary Conditions for identification of those reports of investigations and tests of subsurface and physical conditions at the Site or otherwise affecting cost, progress or performance of the Work which have been reviewed in preparation of the Contract Documents. Such reports are not guaranteed as to accuracy or completeness and are not part of the Contract Documents.

B. The locations of utilities or other physical conditions relating to existing surface or subsurface structures at or contiguous to the Site as shown on the Plans are taken from drawings from sources believed to be reliable. Neither Owner nor Landscape Architect will be responsible for any omissions of, or variations from, the indicated location of existing utilities which may be encountered in the Work.

C. Contractor will draw its own conclusions as to the general accuracy of the "technical data" contained in such reports and drawings, and confirms such reports and drawings are not Contract Documents. Contractor may not rely upon or make any Claim against Owner, Landscape Architect or any of Landscape Architect's Consultants with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto, or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings, or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such data, interpretations, opinions or information.

D. The cost of all the following will be included in the Contract Price and Contractor will have full responsibility for:

1. reviewing and checking all such information and data,

2. locating all Utilities during construction,

3. coordination of the Work with the owners of such Utilities, and

4. the safety and protection of all such Utilities as provided in paragraph 6.15 and repairing any damage thereto resulting from the Work.

4.03 UNFORESEEN PHYSICAL CONDITIONS

A. If Contractor discovers one or both of the following physical conditions of surface or subsurface at the Project or improvement Site, before disturbing the physical condition, Contractor will immediately notify Owner and Landscape Architect of the physical condition; and follow up within 48 hours in writing:

1. A subsurface or a physical condition at the Site differing materially from those indicated in the Contract Documents, or

2. An unknown physical condition at the Site of a nature differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for the improvement project.

B. Landscape Architect's Review. After receipt of written notice as required by the preceding paragraph, Landscape Architect will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in paragraph 4.03.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Landscape Architect's findings, conclusions, and recommendations.

C. Owner's Statement to Contractor Regarding Site Condition. After receipt of Landscape Architect's written findings, conclusions, and recommendations, Owner will issue a written statement to Contractor (with a copy to Landscape Architect) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Landscape Architect's written findings, conclusions, and recommendations, in whole or in part.

D. Possible Price and Times Adjustments:

1. Contractor will be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. such condition must fall within any one or more of the categories described in paragraph 4.03.A;

b. with respect to Work that is paid for on a Unit Price basis, any adjustment in Contract Price will be subject to the provisions of paragraph 12.03; and

c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times pursuant to paragraph 10.05.

2. Contractor wil not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:

a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or

b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

c. Contractor failed to give the written notice as required by paragraph 4.03.A.

3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment will be set forth in a Change Order or Work Change Directive.

4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of Owner's written statement to Contractor regarding the subsurface or physical condition in question.

4.04 UTILITIES

A. Contractor's Responsibilities. The information and data shown or indicated in the Contract Documents with respect to existing Utilities at or adjacent to the Site, if any, is based on information and data furnished to Owner or Landscape Architect by the owners of such Utilities, including Owner, or by others.

1. Owner and Landscape Architect do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and

2. the cost of all of the following will be included in the Contract Price, and Contractor will have full responsibility for:

a. reviewing and checking all information and data regarding existing Utilities at the Site;

b. locating all Utilities shown or indicated in the Contract Documents as being at the Site;

c. coordination of the Work with the owners (including Owner) of such Utilities, during construction; and

d. the safety and protection of all existing Utilities at the Site, and repairing any damage thereto resulting from the Work.

B. Notice by Contractor. If Contractor believes that an Utilities that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor will, promptly after becoming aware thereof and before

further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by paragraph 6.18), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Landscape Architect.

C. Landscape Architect's Review. Landscape Architect will:

1. promptly review the Utilities and conclude whether such Utilities was not shown or indicated in the Contract Documents,

2. or was not shown or indicated with reasonable accuracy;

3. obtain any pertinent cost or schedule information from Contractor;

4. prepare recommendations to Owner regarding Contractor's resumption of Work in connection with the Utilities in question;

5. determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Utilities;

6. and advise Owner in writing of Landscape Architect's findings, conclusions, and recommendations.

D. During such time, Contractor will be responsible for the safety and protection of such Underground Facility.

E. Owner's Statement to Contractor Regarding Utilities. After receipt of Landscape Architect's written findings, conclusions, and recommendations, Owner will issue a written statement to Contractor (with a copy to Landscape Architect) regarding the Utilities in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Landscape Architect's written findings, conclusions, and recommendations in whole or in part.

F. Possible Price and Times Adjustments:

1. Contractor will be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Utilities at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Utilities in question;

b. With respect to Work that is paid for on a Unit Price basis, any adjustment in Contract Price will be subject to the provisions of paragraph 12.03;

c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and

d. Contractor gave the notice required in paragraph 4.04.B.

2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment will be set forth in a Change Order.

3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of Owner's written statement to Contractor regarding the Underground Facility in question.

4.05 REFERENCE POINTS

A. Owner will provide engineering surveys for construction to establish property corners, monuments, bench marks and similar reference points which in Contractor's judgment are necessary to enable Contractor to proceed with the Work. Contractor will be responsible for the preservation of established reference points and will make no changes or relocations without the prior written approval of Owner. Contractor will report to Landscape Architect whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations. Reference points destroyed by negligence of Contractor will be replaced by Owner at the expense of Contractor. Construction Staking will be furnished by Owner as provided in Division 01 of the Specifications.

4.06 CONSTITUENTS OF CONCERN

A. Owner will be responsible for any Constituents of Concern uncovered or revealed at the Site which was not shown or indicated in Plans or Specifications or identified in the Contract Documents to be within the scope of the Work and which may present a substantial danger to persons or property exposed thereto in connection with the Work at the Site. Owner will not be responsible for any such materials brought to the Site by Contractor, Subcontractor, Suppliers or anyone else for whom Contractor is responsible.

B. Upon discovering any such material, Contractor will immediately:

1. stop all Work in connection with such Hazardous Environmental Condition and in any area affected thereby (except in emergency as required by paragraph 6.18), and

2. notify Owner and Landscape Architect (and thereafter confirm such notice in writing). Owner will promptly consult with Landscape Architect concerning the necessity for Owner to retain a qualified expert to evaluate such Hazardous Environmental Condition or take corrective action, if any.

C. Contractor will not be required to resume Work in connection with such Hazardous Environmental Condition or in any such affected areas until after Owner has obtained any required permits related thereto and delivered to Contractor special written notice:

1. specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or

2. specifying any special conditions under which such Work may be resumed safely.

D. If Owner and Contractor cannot agree as to entitlement to, or the amount, or extent of an adjustment, if any, in Contract Price or Contract Terms as a result of such Work stoppage or such special conditions under which Work is agreed by Contractor to be resumed, either party may make a Claim therefor as provided in paragraph 11.01.

E. If after receipt of such special written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order such portion of the Work that is in connection with such condition, or in such affected area, to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to, or the amount, or extent of an adjustment, if any, in Contract Price or Contract Time as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in paragraph 11.01. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with paragraph 7.01.

F. To the fullest extent permitted by Laws and Regulations, Owner will indemnify and hold harmless Contractor, Subcontractors, Landscape Architect, Landscape Architect's Consultants and the officers, directors, employees, agents, other consultants and subcontractors of each and any of them from and against all claims, costs, losses, damages and expenses arising out of or resulting from such condition per this paragraph 4.06, provided that:

1. any such claim, cost, loss or damage is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, and

2. nothing in this paragraph 4.06 will obligate Owner to indemnify any person or entity from and against the consequences of that person's or entity's own negligence.

G. The provisions of paragraph 4.03 are not intended to apply to the presence of Constituents of Concern or Hazardous Environmental Conditions uncovered or revealed at the Site.

ARTICLE 5 BONDS AND INSURANCE

5.01 PERFORMANCE AND OTHER BONDS

A. Contractor will furnish performance and payment Bonds, on the form included in the Contract Documents, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These Bonds will remain in effect at least until 1 year after the date when final payment becomes due, except as otherwise provided by Laws and Regulations or as specified in the Contract Documents or Bond. Contractor will also furnish such other Bonds as are required by the Supplementary Conditions.

B. All Bonds will be in the forms prescribed by the Contract Documents and be executed by such Sureties as

1. are licensed to conduct business in the state where the Project is located, and

2. are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the U.S. Department of Treasury, Financial Management Service, Surety Bond Branch.

C. Bonds signed by an agent must be accompanied by a certified copy of such agent’s authority to act.

D. If Surety on any Bond furnished by Contractor is declared as bankrupt or becomes insolvent, or its right to do business is terminated in any state where any part of the Project is located, or it ceases to meet the requirements of clauses (1) and (2) of paragraph 5.01, Contractor will

within 5 days thereafter substitute another Bond and Surety, both of which will be acceptable to Owner.

5.02 LICENSED INSURERS AND SURETIES

A. Bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor will be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue Bonds or insurance policies for the limits and coverages so required.

5.03 INSURANCE

A. Contractor will purchase and maintain during the term of the Project such insurance as will protect him, Owner(s) and Landscape Architect(s) from Claims arising out of the Work described in this Contract and performed by Contractor, Subcontractor(s) or Sub subcontractor(s) consisting of:

1. Workers' Compensation Insurance including Employer's Liability to cover employee injuries or disease compensable under the Workers' Compensation Statutes of the states in which Work is conducted under this Contract; disability benefit laws, if any; or Federal compensation acts such as U.S. Longshoremen or Harbor Workers', Maritime Employment, or Railroad Compensation Act(s), if applicable. Self-insurance plans approved by the regulatory authorities in the state in which Work on this Project is performed are acceptable.

2. An occurrence form Commercial General Liability policy to cover bodily injury to persons other than employees and for damage to tangible property, including loss of use thereof, plus appropriate endorsements to protect Owner and Landscape Architect against Claims, demands, and lawsuits from employees of Contractor and Subcontractors, including the following exposures:

    a. All premises and operations.

    b. Explosion, collapse and underground damage.

    c. Contractor's Protective coverage for independent contractors or Subcontractors employed by him.

    d. Broad form blanket, contractual liability for the obligation assumed in the Indemnification or Hold Harmless agreement found in the General Conditions or Supplementary Conditions of this Contract.

    e. Personal Injury Liability endorsement with no exclusions pertaining to employment.

    f. Products and Completed Operations coverage. Coverage will extend through the Contract guarantee period.

    g. Broad form property damage.

    h. Cross liability endorsement.

    i. For design professional additional insureds, ISO Endorsement CG 20 32 04 13, “Additional Insured-Engineers, Architects or Surveyors Not Engaged by the Named Insured” or its equivalent.

3. Comprehensive Automobile Liability policy to cover bodily injury and property damage arising out of the ownership, maintenance or use of any motor vehicle, including owned, non-owned and hired vehicles. Comprehensive General Liability and the Comprehensive Auto Liability will be written by the same insurance carrier, though not necessarily in one policy.

4. Contractor will purchase for Owner an Owner's Protective Liability policy to protect Owner, Landscape Architect, their consultants, agents, employees and such public corporations in whose jurisdiction the Work is located for their liability for Work performed by Contractor, the Subcontractor(s) or the Sub subcontractor(s) under this Contract.

5. When a limit of liability is identified in the Supplementary Conditions, Contractor will purchase a Builder's Risk Installation Floater in a form acceptable to Owner covering property of the Project for the full cost of replacement as of the time of any loss which will include, as named insureds,

    a. Contractor,

    b. all Subcontractors,

    c. all Sub subcontractors,

    d. Owner, and Landscape Architect(s) or Architect(s), as their respective interests may prove to be at the time of loss, covering insurable property which is the subject of this Contract, whether in place, stored at the Site, stored elsewhere, or in transit at the risk of the insured(s).

    e. Coverage will be effected on an "All Risk" form including, but not limited to, the perils of fire, wind, vandalism, collapse, theft, flood and earthquake, with removal of passive design error exclusion. Except as may otherwise be required by Owner, Contractor may arrange for such deductibles as Contractor deems to be within Contractor’s ability to self-assume, but Contractor will be held solely responsible for the amount of such deductible and for any co-insurance penalties. Any insured loss will be adjusted with Owner and Contractor and paid to Owner and Contractor as Trustee for the other insureds.

6. Umbrella or Excess Liability:

    a. Contractor is granted the option of arranging coverage under a single policy for the full limit required or by a combination of underlying policies with the balance provided by an Excess or Umbrella Liability policy equal to the total limit(s) requested. Umbrella or Excess policy wording will be at least as broad as the primary or underlying policy(ies) and will apply both to Contractor's General Liability and Automobile Liability Insurance and will be written on an occurrence basis.

7. Railroad Protective Liability:

    a. Where any of the Work is within a railroad right-of-way or where a limit of liability is identified in the Supplementary Conditions, Contractor will provide coverage in the name of each railroad company having jurisdiction over rights of way across which Work under the Contract is to be performed. The form of policy and the limits of liability will be determined by the railroad company(ies) involved. See Section 00 73 00 - Supplementary Conditions for limits and coverage requested.

8. Contractor’s Professional Liability Insurance:

    a. If Contractor will provide or furnish professional services under this Contract through a delegation of professional design services or otherwise, then Contractor will be responsible for purchasing and maintaining applicable professional liability insurance. This insurance will provide protection against Claims arising out of performance of professional design or related services caused by a negligent error, omission, or act for which the insured party is legally liable. It will be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.

B. Owner's responsibilities in respect of purchasing and maintaining insurance are set forth below:

1. Owner will assume responsibility for such boiler and machinery insurance as may be required or considered to be necessary by Owner in the course of construction, testing or after completion.

    a. Owner will assume responsibility for such insurance as will protect Owner against any loss of use of Owner's property due to those perils insured pursuant to paragraph 1 above.

5.04 LIMITS OF LIABILITY

A. The required limits of liability for insurance coverages required in paragraphs 5.03 will be not less than those specified in Section 00 73 00 - Supplementary Conditions .

5.05 NOTICE OF CANCELLATION OR INTENT NOT TO RENEW

A. Policies will be endorsed to provide that at least 30 days written notice will be given to Owner and to Landscape Architect of cancellation, intent not to renew, or material modification of the coverage.

5.06 EVIDENCE OF COVERAGE

A. Prior to commencement of the Work, Contractor will furnish to Owner and Landscape Architect, Certificates of Insurance in force on current Accord® Certificate of Insurance form. Other forms of Certificate are acceptable only if;

1. they include all of the items prescribed in the current Accord® Certificate of Insurance form, including agreement to cancellation provisions outlined in paragraph 5.05 above; and

2. they have approval of Owner and Landscape Architect.

B. Prior to the commencement of the Work, Contractor will furnish to Owner complete "originally signed" copies of the Owner's Protective Liability Policy. The number of copies will be the same as the number of counterparts of the Agreement. Owner reserves the right to request complete copies of other policies if deemed necessary to ascertain details of coverage not provided by the certificates. Such policy copies will be "Originally Signed Copies," and so designated.

5.07 QUALIFICATION OF INSURERS

A. In order to determine financial strength and reputation of insurance carriers, all companies providing the coverages required will be licensed or approved by the Insurance Bureau of the state in which the Project is located and will have a financial rating not lower than XI and a policyholder's service rating no lower than B+ as listed in A.M. Best's Key Rating Guide, current edition. Companies with ratings lower than B+:XI will be acceptable only upon written consent of Owner.

5.08 DAMAGE CLAIMS - ACKNOWLEDGMENT AND REPORTS

A. Contractor will furnish to Owner an acknowledgment receipt from the insurance carrier for each damage claim against the Project. The receipt will include the insurance carrier’s assigned claim number.

B. Upon request, Contractor or Contractor's insurance carrier will also furnish to Owner a status report on all damage claims. This report will include inspections made, the disposition of claims, and what action has been taken towards settlement of each claim.

C. Failure of Contractor to comply with this paragraph 5.08 may result in the amount of such damage claims being withheld from Contractor’s monthly pay estimate. Such withholding will be reimbursed in the monthly pay estimate following compliance with this paragraph.

5.09 COST OF INSURANCE

A. The unit cost of the insurance herein specified will not be a specific bid item, but the cost of such insurance will be included by Contractor in the various prices bid.

5.10 WAIVER OF RIGHTS

A. Owner and Contractor intend that all policies purchased in accordance with paragraph 5.03 will protect Owner, Contractor, Subcontractors, Landscape Architect, Landscape Architect’s Consultants (and all other persons or entities identified in the Supplementary General Conditions to be listed as insureds or additional insureds in such policies) and will provide primary coverage for all losses and damages caused by the perils covered thereby. Such policies will contain provisions to

B. the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder.

C. Owner and Contractor waive all rights against each other and their respective officers, directors, employees and agents for all losses and damages caused by, arising out of or resulting from any of the perils covered by such policies and any other property insurance applicable to the Work; and in addition, waive all such rights against Subcontractors, Landscape Architect, Landscape Architect’s Consultants and any other persons or entities identified in the Supplementary General Conditions to be listed as insureds or additional insureds under such policies for loss and damages so caused. None of the above waivers will extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.

5.11 RECEIPT AND APPLICATION OF INSURANCE PROCEEDS

A. Any insured loss under the policies of insurance required by paragraph 5.03.A.5 will be adjusted with Owner and made payable to Owner as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause. If no

other special agreement is reached the damaged Work will be repaired or replaced, the monies so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order, Field Oder or Work Change Directive.

B. Owner as fiduciary will have power to adjust and settle any loss under the policies required by paragraph 5.03.A.5 with the insurers unless one of the parties in interest will object in writing within fifteen days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary will make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary will adjust and settle the loss with the insurers.

ARTICLE 6 CONTRACTOR'S RESPONSIBILITIES

6.01 SUPERVISION AND SUPERINTENDENCE

A. Contractor will supervise and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor will be solely responsible for the means, methods, techniques, sequences and procedures of construction. Contractor will be responsible to see that the finished Work complies with the Contract Documents. However, if specific means, methods, techniques, sequences and procedures of construction are prescribed in the Plans or Specifications, Contractor will be responsible to comply therewith, but may implement such prescribed Work in a manner of Contractor's choosing so long as the Work complies with the requirements of the Plans and Specifications.

B. At all times during the progress of the Work, Contractor will assign and maintain a competent superintendent who will not be replaced without written notice to Owner and Landscape Architect except under extraordinary circumstances. Any superintendent or foreman who neglects to have Work done in accordance with the Plans and Specifications will be removed from the Project. The superintendent will be Contractor's representative at the Site and will have authority to act on behalf of Contractor. All communications given to the superintendent will be as binding as if given to Contractor.

6.02 LABOR AND WORKING HOURS

A. Contractor will provide competent, suitably qualified personnel in their various duties. Contractor will at all times maintain good discipline and order at the Site. Except as otherwise required for the safety or protection of persons, the Work, property at the Site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all Work at the Site will be performed during regular working hours (7:00 a.m. to 7:00 p.m.), and Contractor will not permit the performance of Work on Sunday or any legal holiday without Owner's written consent given after prior written notice to Landscape Architect.

6.03 SERVICES, MATERIALS AND EQUIPMENT

A. Unless otherwise specified in the Contract Documents, Contractor will furnish and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start up and completion of the Work.

B. All materials and equipment will be of good quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Contract Documents will expressly run to the benefit of Owner. If required by Landscape Architect, Contractor will furnish satisfactory evidence, (including reports of required tests) as to the kind and quality of materials and equipment to be incorporated in the Work. Contractor will not use material in the Work until Shop Drawing or Submittals have been reviewed by Landscape Architect. All materials which do not meet the requirements of the Specifications at the time they are to be used will be rejected, and unless otherwise permitted by Landscape Architect, will be plainly marked and removed immediately from the Work.

C. All materials and equipment will be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable manufacturer, fabricator, Supplier or distributor, except as otherwise provided in the Contract Documents.

6.04 SUBSTITUTES AND "OR-EQUALS"

A. Whenever an item of materials or equipment is specified or described in the Contract Documents for installation in the Work by using the name of a proprietary item or the name of a particular manufacturer, fabricator, supplier or distributor; or means, methods, techniques, sequences and procedures of construction are prescribed in the Plans or Specifications; the specification or description is intended to establish the type, function and quality required or the means, methods, techniques, sequences and procedures of construction required. Unless the specification or description contains or is followed by words indicating that no like, equivalent or "or-equal" item or no substitution is permitted, other items of material or equipment or materials or equipment of other manufacturers, fabricators, suppliers or distributors; or other means, methods, techniques, sequences and procedures of construction may be accepted by Landscape Architect under the following circumstances:

1. "Or-Equal": If in Landscape Architect's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Landscape Architect as an "or-equal" item, in which case review and approval of the proposed item may, in Landscape Architect's sole discretion, be accomplished without compliance with some or all of the requirements for acceptance of proposed substitute items.

2. Substitute Items: If in Landscape Architect's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under paragraph 6.04.A; or a proposed means, methods, techniques, sequences and procedures of construction are different from what is prescribed in the Plans or Specifications, it will be considered a proposed substitute item.

B. Contractor will submit sufficient information as provided below to allow Landscape Architect to determine that the item of material or equipment or means, methods, techniques, sequences and/or procedures proposed is essentially equivalent to that named and an acceptable substitute therefor. The procedure for review by Landscape Architect will include the following, as supplemented in the Specifications, and as Landscape Architect may decide is appropriate under the circumstances. Requests for review of substitute items of material and equipment will not be accepted by Landscape Architect from anyone other than Contractor.

C. If Contractor wishes to furnish or use a substitute, Contractor will make written application to Landscape Architect on the Substitution Request Form provided for acceptance thereof, certifying that the proposed substitute will:

1. perform adequately the functions and achieve the results called for by the general design,

2. be similar in substance to that specified,

3. and be suited to the same use and capable of performing the same function as that specified.

4. The application will state the extent, if any, to which the evaluation and acceptance of the proposed substitute will prejudice Contractor's achievement of Substantial Completion on time, whether or not acceptance of the proposed substitute for use in the Work will require a change in the Contract Documents (or in the provisions of any other direct contract with Owner for work on the Project) to adapt the design to the proposed substitute, and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty.

D. All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service will be indicated. The application will also contain an itemized estimate of all costs or credits that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which will be considered by Landscape Architect in evaluating the proposed substitute. Landscape Architect may require Contractor to furnish additional data about the proposed substitute.

E. All data to be provided by Contractor in support of any proposed "or-equal" or substitute item will be at Contractor's expense. Landscape Architect will be the sole judge of acceptability, and Landscape Architect's determination will be final and binding, may not be reversed through an appeal under any provisions of the Contract Documents, and no "or-equal" or substitute will be ordered, installed or utilized without Landscape Architect's prior written acceptance. Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any "or-equal" or substitute which has been approved by Landscape Architect.

F. Landscape Architect will record time required by Landscape Architect and Landscape Architect's consultants in evaluating substitutions proposed by Contractor and in making changes in the Contract Documents occasioned thereby. Whether or not Landscape Architect accepts a proposed substitute, Contractor will reimburse Owner for the charges of Landscape Architect and Landscape Architect's consultants for evaluating any proposed substitute and in making any changes in the Contract Documents resulting therefrom.

6.05 CONCERNING SUBCONTRACTORS

A. Contractor will not employ any Subcontractor, Supplier or other person or organizations, including those who are to furnish the principal items of materials or equipment, whether initially or as a substitute, against whom Owner or Landscape Architect may have reasonable objection. Contractor will furnish Landscape Architect a complete list of any Subcontractor, Supplier or other person or organization furnishing principal items of material or equipment within 4 days of request. Failure to object to any Subcontractor, Supplier, other person or

organization by Owner or Landscape Architect will not constitute a waiver of any right of Owner or Landscape Architect to reject defective Work.

B. If Owner or Landscape Architect, after due investigation, has reasonable objection to any Subcontractor, Supplier, other person or organization proposed by Contractor after the Notice of Award, Contractor will submit an acceptable substitute and the Contract Price will be increased or decreased by the difference in cost occasioned by such substitution, and an appropriate Change Order will be issued. Contractor will not be required to employ any Subcontractor, Supplier, other person or organization against whom Contractor has reasonable objection.

C. Contractor will not award Work to Subcontractor(s), in excess of 50% of the Contract Price, without prior written approval of Owner.

D. Contractor will be fully responsible for all acts and omissions of Contractor's Subcontractors, Suppliers and of persons and organizations performing or furnishing any of the Work under a direct or indirect contract with Contractor just as Contractor is responsible for Contractor’s own acts and omissions. Nothing in the Contract Documents will create for the benefit of any such Subcontractor, Supplier of other person or organization any contractual relationship between Owner or Landscape Architect and any such Subcontractor, Supplier or other person or organization, nor will it create any obligation on the part of Owner or Landscape Architect to pay or to see to the payment of any moneys due any Subcontractor, Supplier or other person or organization. Owner or Landscape Architect may furnish to any Subcontractor, Supplier or other person or organization, to the extent practicable, evidence of amounts paid to Contractor on account of specific Work done.

E. Contractor will be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with Contractor. Contractor will require all Subcontractors, Suppliers and such other persons and organizations performing or furnishing any of the Work to communicate with Landscape Architect through Contractor.

F. If the amount of the subcontract or the nature of the Work to be performed thereunder warrants, Owner may require Subcontractor to furnish, for the benefit of Owner and Contractor jointly, Bonds in an amount proportioned to the amount of Subcontractor's subcontract, and for the same purpose and under the same specifications as those of the general Contract. The Surety on the general Contract will not be eligible to furnish such Subcontract Bonds.

G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Landscape Architect. Whenever any such agreement is with a Subcontractor or Supplier who is listed as and additional insured on the property insurance provided in paragraph 5.03.A.5, the agreement between Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Landscape Architect, Landscape Architect’s Consultants and all other additional insureds for all losses and damages caused by, arising out of or resulting from any of the perils covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same. Contractor will file a true copy of such agreement with Owner.

6.06 PATENT FEES AND ROYALTIES

A. Contractor will pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of Owner or Landscape Architect its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights will be disclosed by Owner in Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Contractor will defend, indemnify and hold harmless Owner and Landscape Architect and anyone directly or indirectly employed by either of them from and against all claims, costs, losses, damages and expenses arising out of or resulting from any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product or device not specified in the Contract Documents, and will defend all such claims in connection with any alleged infringement of such rights.

6.07 PERMITS AND LICENSES

A. Contractor will obtain and pay for all construction permits and licenses. Owner will assist Contractor, when necessary, in obtaining such permits and licenses. Contractor will pay all governmental charges, permit, review, and inspection fees necessary for the prosecution of the Work, which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Contractor will pay all charges of utility owners for connections to the Work.

6.08 LAWS AND REGULATIONS

A. Contractor will give all notices and comply with all laws, ordinances, rules, and regulations applicable to furnishing and performance of the Work. Neither Owner nor Landscape Architect will be responsible for monitoring Contractor’s compliance with any Laws, ordinances, rules, and Regulations.

B. If Contractor performs any Work that is contrary to such laws, ordinances, rules and regulations, Contractor will bear all claims, costs, losses, damages and expenses caused by, arising out of, or resulting therefrom. However, it will not be Contractor's primary responsibility to make certain that the Specifications and Plans are in accordance with such laws, ordinances, rules, and regulations, but this will not relieve Contractor of Contractor’s obligations under paragraph 3.03.

C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor’s Bid (or after the date when Contractor became bound under a negotiated Contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to, or on the amount, or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

6.09 TAXES

A. Contractor will pay all sales, consumer, use and other similar taxes required to be paid by Contractor in accordance with Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.10 USE OF PREMISES

A. Contractor will confine construction equipment, the storage of materials and equipment and the operations of workers to the Project Site and land and areas identified in and permitted by the Contract Documents and other land and areas permitted by Laws and Regulations, rights of way, permits and easements, and will not unreasonably encumber the premises with construction equipment or other materials or equipment. Contractor will assume full responsibility for any damage to any such land or area or to the owner or occupant thereof or of any adjacent land or areas resulting from the performance of the Work. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor will promptly settle with any such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law. Contractor's continuing obligations under paragraph 6.24 will be applicable to any claim hereunder.

6.11 REMOVAL OF DEBRIS AND CLEANING

A. During the progress of the Work, Contractor will keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work Contractor will remove all waste materials, rubbish and debris from and about the premises as well as all tools, appliances, construction equipment and machinery, and surplus materials, and will leave the Site clean and ready for occupancy by Owner at Substantial Completion of the Work. Contractor will restore to their original condition all property not designated for alteration by the Contract Documents. If Contractor will fail to keep the above noted areas cleaned of dust or debris resulting from Contractor's operations, Contractor will be so notified in writing by Landscape Architect. If within 24 hours after receipt of such notice Contractor will fail to clean such areas satisfactorily, Owner may have such other agency as Ownerhe will designate, perform the work and all costs of such cleaning will be paid for by Contractor.

6.12 LOADING STRUCTURES

A. Contractor will not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor will Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.13 PROTECTION OF UTILITIES

A. When it is possible for construction operations to endanger any public or private utility, conduit, or structure, Contractor will notify the utility owner of this possibility, and safeguard and support such utilities, conduits, or structures. Where it is the policy of any utility owner to make its own repairs to damaged conduit or other structures, Contractor will cooperate to the fullest extent with the utility, and Contractor will see that Contractor's operations interfere as little as possible with these operations, and Contractor will assume the cost of any charge against Owner therefor. In cases where existing Utilities or Utility service connections are encountered, Contractor will perform Contractor's operations in such a manner that service will be uninterrupted, and the cost thereof will be at Contractor's expense, unless otherwise provided.

6.14 RECORD DOCUMENTS

A. Contractor will maintain in a safe place at the Site 1 record copy of all Specifications, Plans, Addenda, Change Orders, Work Change Directives, and Field Orders, in good order and annotated to show all changes made during construction. These record documents together with all Samples and all Shop Drawings will be available to Landscape Architect for examination and will be delivered to Landscape Architect for Owner upon completion of the Work.

6.15 SAFETY AND PROTECTION

A. Contractor will be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor will take all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Work Site or who may be affected by the Work,

2. all the Work and materials or equipment to be incorporated therein, whether in storage on or off the Site, and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and Utilities and not designated for removal, relocation or replacement in the course of construction.

B. Contractor will comply with all applicable Laws and Regulations and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss; and will erect and maintain all necessary safeguards for such safety and protection. Contractor will notify owners of adjacent property, Utilities, and utility owners when prosecution of the Work may affect them.

C. Contractor will restore, at Contractor's own expense, any public or private property damaged or injured in consequence of any act or omission on Contractor's part, or on the part of Contractor's employees or agents, to a condition equal or better than that existing before such injury or damage was done. If Contractor neglects to restore or make good such damages or injury, Owner may, upon 48 hours' notice, proceed to restore or make good such damage or injury and to order the cost thereof deducted from any monies that are due, or may become due, to Contractor for this Work.

D. Contractor's duties and responsibilities for the safety and protection of the Work will continue until such time as all the Work is completed and Landscape Architect has issued a notice to Owner and Contractor in accordance with paragraph 14.11 that the Work is Acceptable.

E. Contractor will comply with the applicable requirements of Owner’s safety programs, if any. Any Owner’s safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.

F. Contractor will inform Owner and Landscape Architect of the specific requirements of Contractor’s safety program with which Owner’s and Landscape Architect’s employees and representatives must comply while at the Site.

G. Contractor’s duties and responsibilities for safety and protection will continue until all the Work is completed, Landscape Architect has issued a written notice to Owner and Contractor in accordance with paragraph 14.11 that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).

H. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

6.16 SAFETY REPRESENTATIVE

A. Contractor will be responsible to designate for itself and its employees, and its Subcontractors a qualified and experienced safety representative at the Site whose duties and responsibilities will be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.17 HAZARD COMMUNICATION PROGRAM

A. Contractor will be responsible for coordinating any exchange of safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with applicable Laws or Regulations.

6.18 EMERGENCIES

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor, without special instruction or authorization from Owner or Landscape Architect, is obligated to act to prevent threatened damage, injury or loss. Contractor will give Landscape Architect prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If Landscape Architect determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued to document the consequences of such action.

6.19 SHOP DRAWINGS AND SAMPLES

A. Contractor will submit Shop Drawings required by the Contract Documents to Landscape Architect for review, in accordance with an accepted schedule. All Submittals will be identified as Landscape Architect may require and in the number of copies specified in the Specifications. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to show Landscape Architect the materials and equipment Contractor proposes to provide and to enable Landscape Architect to review the information for the limited purposes required by paragraph 6.21.

B. Contractor will also submit all samples required by the Contract Documents to Landscape Architect for review in accordance with an accepted schedule. Each Sample will be identified clearly as to material, Supplier, pertinent data such as catalog numbers, the use for which intended, and other data as Landscape Architect may require to enable Landscape Architect to review the Submittal for the limited purposes required by paragraph 6.21. The number of each sample to be submitted will be as specified in the Specifications.

6.20 SUBMITTAL PROCEDURES

A. Before submitting each Shop Drawing or Sample, Contractor will have determined and verified:

1. all field measurements, quantities, dimension, specified performance criteria, installation requirements, manufacturer’s recommendations, material, catalog numbers and similar information with respect thereto,

2. all materials with respect to intended use, fabrication, shipping, handling, storage, assembly and installation pertaining to the performance of the Work, and

3. all information relative to Contractor’s responsibilities in respect of means, methods, techniques, sequences and procedures of construction and safety precautions and programs incident thereto.

B. Contractor will have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

C. Each Submittal will be assigned a unique sequential integer corresponding to the order in which it was submitted.

D. Each Submittal will correspond to and reference one and only one Section. However, a single Section may have multiple Submittals.

E. Each Submittal will bear a stamp or specific written indication that Contractor has satisfied Contractor’s obligations under the Contract Documents with respect to review and approval of that Submittal.

F. At the time of each submission, Contractor will in writing call Landscape Architect's attention to any deviations that the Shop Drawings or Samples may have from the requirements of the Contract Documents. This notice will be both a written communication separate from the Shop Drawing’s or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Landscape Architect for review of each such variation.

G. Contractor will make corrections required by Landscape Architect and will return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review. Contractor will direct specific attention in writing to revisions other than the corrections called for by Landscape Architect on previous Submittals.

H. Contractor will furnish required Submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Landscape Architect will record Landscape Architect’s time for reviewing a fourth or subsequent submittal of Shop Drawings, sample, or other item requiring approval, and Contractor will be responsible for Landscape Architect’s charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.

I. If Contractor requests a change of a previously approved Submittal item, Contractor will be responsible for Landscape Architect’s charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

6.21 LANDSCAPE ARCHITECT’S REVIEW

A. Landscape Architect will review Shop Drawings and Samples in accordance with the Schedule of Submittals accepted by Landscape Architect as required by paragraph 2.05. Landscape Architect's review will be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and will not extend to means,

methods, sequences, techniques or procedures of construction or to safety precautions or programs incident thereto. The review of a separate item as such will not indicate review of the assembly in which the item functions.

B. Landscape Architect's review of Shop Drawings or samples will not relieve Contractor from responsibility for any variations from the Contract Documents unless Contractor has in writing called Landscape Architect's attention to such variation at the time of submission and Landscape Architect has given written concurrence to the specific variation, nor will any concurrence by Landscape Architect relieve Contractor from responsibility for errors or omissions in the Shop Drawings. Landscape Architect's review will not relieve Contractor from responsibility for complying with the requirements of paragraph 6.20.

C. Where a Shop Drawing or sample is required by the Contract Documents or the Schedule of Submittals accepted by Landscape Architect per paragraph 2.05, no related Work will be commenced until the Submittal has been reviewed by Landscape Architect.

6.22 CONTINUING THE WORK

A. Contractor will carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, except as Contractor and Owner may otherwise agree in writing.

6.23 CONTRACTOR'S GENERAL WARRANTY AND GUARANTEE

A. Contractor warrants and guarantees to Owner, Landscape Architect, and Landscape Architect's Consultants that all work will be in accordance with the Contract Documents and will not be defective. Contractor's warranty and guarantee excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or their employees, agents, or representatives, or any person or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

B. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents will be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Landscape Architect;

2. recommendation of any progress or final payment by Landscape Architect;

3. the issuance of a certificate of Substantial Completion or any payment by Owner to Contractor under the Contract Documents;

4. use or occupancy of any part of the Work by Owner;

5. any acceptance by Owner or failure to do so;

6. any review or approval of a Shop Drawing or Sample Submittal or the issuance of a notice of acceptability by Landscape Architect per paragraph 14.11;

7. any inspection, test or approval by others; or

8. any correction of defective Work by Owner.

C. If Contract requires Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned Contract.

D. Contractor will assign to Owner all warranties extended to Contractor by material Suppliers and Subcontractors. If an assignment of warranty requires the material Supplier or Subcontractor to consent to same, then Contractor will secure the material Supplier's or Subcontractor's consent to assign said warranties to Owner.

E. The warranties provided in this section will be in addition to, and not in limitation of, any other warranty or remedy required by law.

6.24 INDEMNIFICATION

A. To the fullest extent permitted by law, Contractor will indemnify, defend (with counsel acceptable to Owner) and hold harmless Owner, Landscape Architect and any additional indemnitees identified in the Supplementary Conditions and their respective directors, officers, members, partners, affiliates, employees, agents and successors, from and against any and all liabilities, claims, causes of action, lawsuits, liens, injuries, damages, losses and expenses (collectively "Demands") to the extent caused by, arising out of, resulting from or occurring in connection with:

1. Contractor's breach of, or failure to comply with, the Agreement, the Contract Documents, or any other contract that it enters into regarding the Work, including any default in performance; or

2. Personal injury or death to any person (including, but not limited to, Contractor, Contractor's employees, Subcontractors, Subcontractors' employees, and material Suppliers) or injury to or destruction of property (including claims for loss of use) caused by, arising out of, resulting from, or in any way connected with

   a. the Work,

   b. any activity associated with the Work, or

   c. the operations or acts of commission or omission of Contractor, Contractor's employees, Subcontractors, Subcontractors' employees, material suppliers, or anyone for whom Contractor is legally liable in the performance of Work, whether arising before or after completion of the Work.

B. To the extent caused by, arising out of, resulting from, or occurring in connection with the provisions of the above paragraph 6.24.A, Contractor's indemnity obligations under this Agreement will include, but are not limited to:

1. Indemnity for all damages and judgment interest, all costs and fees, including, but not limited to, all defense costs, expenses and actual attorneys' fees, and all settlement payments relating to, arising out of, resulting from or in any way connected with any demand requiring indemnity by this Agreement;

2. All expenses, including but not limited to, costs, expenses and actual attorneys' fees, incurred in securing and enforcing indemnity from Contractor if Contractor fails or refuses promptly to fulfill any of the indemnity obligations under this Agreement;

3. All indemnification obligations imposed upon Owner or Landscape Architect, or both, arising out of or in connection with the Work; and

4. Indemnification for any penalties and/or fines arising or resulting from Contractor's or any Subcontractor's failure to comply with laws and/or regulations applicable to its/their Work.

C. Contractor's duty to indemnify under subpart A.2. of paragraph 6.24 is limited to the negligence of Contractor, Contractor's employees, Subcontractors, Subcontractor's employees, material Suppliers, or anyone for whom Contractor is legally liable in the performance of the Work, whether arising before or after the completion of the Work.

D. The indemnification rights under this Agreement will not be construed to negate, abridge, or otherwise reduce any other right or obligations of indemnity which would otherwise exist.

E. Owner, at its option, may select counsel to defend any demand brought against it without impairing any obligation of Contractor to provide indemnification.

F. The indemnification provisions under this Agreement will survive the completion or termination of this Agreement.

G. In the case of claims by any employee of Contractor, anyone directly or indirectly employed by Contractor, or anyone for whose acts Contractor may be liable, the indemnification obligations under this Agreement will not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for Contractor under workers' compensation acts. Such obligations will not be construed to negate, abridge or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Agreement.

H. Indemnification, additional insured and hold harmless obligations of Contractor and Subcontractor under the Contract Documents will survive the termination of this Agreement.

I. Contractor and Subcontractors will compel their insurance company to waive subrogation against Owner, Landscape Architect and Contractor and Subcontractors identified as additional insureds in the Contract Documents, including any municipal entity now existing or newly created during the term of the Contract Documents.

6.25 DELEGATION OF PROFESSIONAL DESIGN SERVICES

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences or procedures. Contractor will not be required to provide professional services in violation of applicable Laws and Regulations.

B. If professional design services or certifications by a design professional related to systems, materials, equipment, structures, means, methods, techniques or sequences of construction are specifically required of Contractor by the Contract Documents, Owner and Landscape Architect will specify all performance and design criteria that such services must satisfy. Contractor will cause such services or certifications to be provided by a professional properly

licensed in the state in which the project is located, whose signature and seal will appear on all drawings, calculations, specifications, certifications, and other Submittals prepared by such professional. Shop Drawings and other Submittals related to the Work designed or certified by such professional, if prepared by others, will bear such professional's written approval when submitted to Landscape Architect.

C. Owner and Landscape Architect will be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals.

D. Pursuant to this paragraph 6.25, Landscape Architect's review or approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Landscape Architect's review or approval of Shop Drawings and other Submittals (except design calculations and design drawings) will be only for the purpose stated in paragraph 6.21.

E. Contractor will not be responsible for the adequacy of the performance or design criteria specified by Owner or Landscape Architect.

ARTICLE 7 WORK BY OTHERS

7.01 RELATED WORK AT SITE

A. In addition to and apart from the Work under the Contract Documents, Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

B. If any part of Contractor's Work depends on proper execution or results upon the work of any such other contractor or utility owner, Contractor will inspect and promptly report to Landscape Architect in writing any delays, defects or deficiencies in such other work that render it unavailable, or unsuitable for such proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of the other work as fit and proper for integration with Contractor's Work except for latent or non-apparent defects and deficiencies in the other work.

C. Contractor will afford each contractor who is party to such a direct contract, and each utility owner, (and Owner, if Owner is performing the additional work with Owner's employees), 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 other work and will properly connect and coordinate the Work with theirs. Unless otherwise provided in the Contract Documents, Contractor will do all cutting, fitting and patching of Contractor's Work that may be required to make its several parts come together properly and integrate with such other work. Contractor will not endanger any work of others by cutting, excavating or otherwise altering their work and will only cut or alter their work with the written consent of Landscape Architect and the others whose work will be affected.

D. If the performance of additional work by other contractors, utility owner, or Owner was not noted in the Contract Documents, written notice thereof will be given to Contractor prior to starting any such additional work. If Contractor believes that the performance of such additional

work by Owner or others involves additional expense to Contractor, or requires an extension of the Contract Time, Contractor may make a Claim therefor as provided in paragraph 11.01. Claims for delay or inconveniences due to operations of such other parties for work noted in the Contract Documents will not be allowed.

ARTICLE 8 OWNER'S RESPONSIBILITIES

8.01 COMMUNICATION TO CONTRACTOR

A. Except as otherwise provided in these General Conditions, Owner will issue all communications to Contractor through Landscape Architect.

8.02 REPLACEMENT OF LANDSCAPE ARCHITECT

A. In case of termination of the employment of Landscape Architect, Owner will appoint an engineer against whom Contractor makes no reasonable objection, whose status under the Contract Documents will be that of the former Landscape Architect.

8.03 FURNISHING DATA

A. Owner will furnish the data required of Owner under the Contract Documents promptly.

8.04 PAY WHEN DUE

A. Owner will make payments to Contractor promptly after they are due as provided in paragraphs 14.05 and 14.11.

8.05 LANDS AND EASEMENTS; REPORTS AND TESTS

A. Owner's duties in respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of investigations and tests of subsurface and latent physical conditions at the Site.

8.06 CHANGE ORDERS

A. In connection with Owner's rights to request changes in the Work in accordance with Article 10, Owner (especially in certain instances as provided in paragraph 10.01) is obligated to execute Change Orders.

8.07 INSPECTIONS, TESTS, AND APPROVALS

A. Owner's responsibility in respect to certain inspections, tests and approvals is set forth in paragraph 13.02.

8.08 LIMITATION ON OWNER’S RESPONSIBILITY

A. Owner will not supervise, direct or have control or authority over, nor be responsible for, Contractor’s means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the furnishing or performance of the Work. Owner will not be responsible for Contractor’s failure to perform or furnish the Work in accordance with the Contract Documents.

8.09 UNDISCLOSED HAZARDOUS MATERIALS

A. Owner’s responsibility in respect of undisclosed Constituents of Concern uncovered or revealed at the Site is set forth in Paragraph 4.06.

8.10 OWNER’S DESIGNATED REPRESENTATIVE

A. Owner will designate a person to act as its representatives during the performance of the Work. Owner’s designated representative will attend meetings and perform on behalf of Owner all obligations required of Owner under the provisions of the Contract Documents.

ARTICLE 9 LANDSCAPE ARCHITECT'S STATUS DURING CONSTRUCTION

9.01 OWNER'S REPRESENTATIVE

A. Landscape Architect will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Landscape Architect as Owner's representative during construction will be as set forth in the Contract Documents.

9.02 VISITS TO SITE

A. Landscape Architect may make visits to the Site at intervals appropriate to the various stages of construction to observe the progress and quality of the executed Work, and to determine solely for the benefit of Owner, in general, if the Work is proceeding in accordance with the technical requirements of the Contract Documents. It will not be the responsibility of Landscape Architect to make exhaustive or continuous on Site inspections to check the quality or quantity of the Work.

9.03 RESIDENT PROJECT REPRESENTATIVE

A. If Owner and Landscape Architect agree, Landscape Architect will furnish a Resident Project Representative to assist Landscape Architect in providing more continuous observation of the Work. A Resident Project Representative will act as directed by and under the supervision of Landscape Architect. Resident Project Representative's dealings in matters pertaining to the on Site Work will in general be only with Landscape Architect and Contractor, and dealings with Subcontractors will only be through or with the full knowledge of Contractor. The Resident Project Representative's duties and responsibilities include:

1. Schedules:

    a. Review the Progress Schedule, Schedule of Submittals and Schedule of Values prepared by Contractor.

2. Conferences:

    a. Arrange a schedule of progress meetings and other job conferences as required in consultation with Landscape Architect and Owner, and notify those expected to attend in advance.

3. Liaison:

    a. Serve as Landscape Architect's liaison with Contractor, working principally through Contractor's superintendent and assist him in understanding the intent of the technical aspects of the Contract Documents. Assist Landscape Architect in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on Site operations.

4. Shop Drawings and Samples:

a. Advise Landscape Architect and Contractor, or Contractor’s superintendent, immediately of the commencement of any Work requiring a Shop Drawing or Sample submission if the submission was identified on the schedule and has not been reviewed by Landscape Architect.

5. Review of Work, Rejection of Defective Work, Inspections, and Tests:

   a. Conduct on Site observations of the Work and report to Landscape Architect whenever Resident Project Representative believes that technical aspects of any executed Work is unsatisfactory, faulty or defective or does not meet the requirements of any inspections, tests or approval required to be made or has been damaged prior to final payment; and advise Landscape Architect when Resident Project Representative believes that any partially completed portion of the Work should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.

   b. Observe, record and report to Landscape Architect appropriate details relative to test procedures and startups.

   c. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Project, record the outcome of these inspections and report to Landscape Architect.

6. Modifications:

   a. Consider Contractor's suggestions for modifications in Plans or Specifications and report them to Landscape Architect.

7. Reports:

   a. Prepare periodic reports as required of progress of the Work and Contractor's compliance with the approved Progress Schedule and Schedule of Submittals.

8. Completion:

   a. Verify that all items on final list of items requiring completion or correction have been completed or corrected and make recommendations to Landscape Architect concerning acceptance.

9. Exceptions:

   a. Resident Project Representative:

      1) Shall not authorize any deviation from the Contract Documents or approve any substitute materials or equipment.

      2) Shall not approve or accept any portion of the completed Work.

      3) Shall not undertake any of the responsibilities of Contractor, Subcontractors or Contractor's superintendent, or expedite the Work.

      4) Shall not advise on or issue directions relative to any aspect of the means, methods, techniques, sequences or procedures of construction unless such is specifically called for in the Contract Documents.

5) Shall not advise on or issue directions as to safety precautions and programs in connection with the Work.

6) Shall not advise on or issue directions regarding Contractor's failure to comply with Laws and Regulations applicable to the furnishing or performance of the Work.

9.04 CLARIFICATIONS AND INTERPRETATIONS

A. Landscape Architect will issue with reasonable promptness such written clarifications or interpretations of the Contract Documents as Landscape Architect may determine necessary, which will be consistent with or reasonably inferable from the overall intent of the Contract Documents.

9.05 AUTHORIZED VARIATIONS IN WORK - FIELD ORDER

A. Landscape Architect may authorize minor adjustments in the Work to avoid obstructions or interferences which do not involve an adjustment in the Contract Price or the Contract Time, and which are consistent with the overall intent of the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner, and also on Contractor who will perform the change promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a request for a Change Proposal may be made therefore as provided in paragraph 10.06 or a Claim may be submitted as set forth in paragraph 11.01.

9.06 REJECTING DEFECTIVE WORK

A. Landscape Architect will have authority to disapprove or reject completed portions of the Work which Landscape Architect believes to be defective and will also have authority to require special inspection or testing of the Work as provided in paragraph 13.04, whether or not the Work is fabricated, installed or completed.

9.07 SHOP DRAWINGS, CHANGE ORDERS, AND PAYMENTS

A. Landscape Architect's responsibility for Shop Drawings and samples are set forth in paragraphs 6.19 through 6.21 inclusive.

B. Landscape Architect's responsibilities as to Change Orders are set forth in Articles 10, 11, and 12.

C. Landscape Architect's responsibilities in respect of Applications for Payment are set forth in Article 14.

9.08 DETERMINATIONS FOR UNIT PRICE WORK

A. Landscape Architect will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Landscape Architect will review Landscape Architect's preliminary determinations with Contractor on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Landscape Architect's written decision thereon will be final and binding (except as modified by Landscape Architect to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of paragraph 10.06.

9.09 DECISIONS ON DISAGREEMENTS, CLAIMS

A. Landscape Architect will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work performed thereunder. Claims, disputes and other matters relating to the acceptability of the Work, or the interpretation of the requirements of the Contract Documents pertaining to the execution and progress of the Work, will be referred initially to Landscape Architect in writing with a request for a formal decision in accordance with this paragraph 9.09.

B. Landscape Architect will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believe that any such decision entitles them to an adjustment in the Contract Price, or Contract Times, or both, a Claim may be made under paragraph 11.01.

C. Landscape Architect's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of paragraph 11.01.

D. In this capacity Landscape Architect will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.10 LIMITATIONS ON LANDSCAPE ARCHITECTS RESPONSIBILITIES

A. Neither Landscape Architect's authority to act under this Article 9 or elsewhere in the Contract Documents, nor any decision made by Landscape Architect in good faith either to exercise or not exercise such authority, will give rise to any duty or responsibility of Landscape Architect to Owner or Contractor, any Subcontractor, any manufacturer, fabricator, Supplier, distributor, surety, or any other person, employee, or agent of any of them.

B. Landscape Architect will not supervise, direct, control or have authority over, or be responsible for Contractor's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the furnishing or performance of the Work. Landscape Architect will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents. These limitations on authority and responsibility will also apply to Landscape Architect's Consultant's, Resident Project Representative and assistants.

C. Landscape Architect will not be responsible for the acts or omissions of Contractor or of any Subcontractor, Supplier, or of any other individual or entity performing any of the Work.

D. Landscape Architect will not be responsible to Contractor or any Subcontractor, or Supplier, or to their agents or employees for injuries, damages, claims, losses, or expenses (including attorney's fees) of whatsoever kind resulting from or caused by any act or omission of Landscape Architect in preparation for, arising from, relating to, or concerning the Project. Such acts or omissions include, but are not limited to, Landscape Architect's negligence, tortuous conduct, errors, omissions, strict liability, breach of contract, or breach of warranty. Landscape Architect makes no representations to Contractor, Subcontractors, Suppliers or their agents or employees regarding or respecting any work performed by Landscape Architect in preparation for, arising from, relating to, or concerning the Project.

E. Neither Contractor, its agents or employees, nor any Subcontractors or Suppliers or their agents or employees, are intended beneficiaries of Landscape Architect's agreement with Owner, nor are such parties intended beneficiaries of Landscape Architect's duties or responsibilities arising therefrom. Landscape Architect disclaims all duties to Contractor,

Subcontractors, Suppliers or their agents or employees arising from, relating to, or concerning Landscape Architect's involvement in the Project. Owner and Contractor further agree to notify all Contractor's, Subcontractors or Suppliers of this disclaimer of Landscape Architect's liability and require them to abide by this disclaimer.

ARTICLE 10 AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

10.01 AMENDING AND SUPPLEMENTING CONTRACT DOCUMENTS

A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

1. Change Orders:

a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.

b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve;

1) the performance or acceptability of the Work,

2) the design (as set forth in the Drawings, Specifications, or otherwise), or

3) other engineering or technical matters, without the recommendation of Landscape Architect. Such an amendment will be set forth in a Change Order.

2. Work Change Directives:

a. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including paragraph 10.04 regarding change of Contract Price.

b. Contractor must submit any Change Proposal seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the issuance of the Work Change Directive.

c. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. Field Orders:

a. Landscape Architect may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and

will be binding on Owner and Contractor, which will perform the Work involved promptly.

b. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor will submit a Change Proposal as provided herein.

10.02 OWNER-AUTHORIZED CHANGES IN THE WORK

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes will be supported by Landscape Architect's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive.

B. Upon receipt of any such document, Contractor will promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work will be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph 10.02 will obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

10.03 UNAUTHORIZED CHANGES IN THE WORK

A. Contractor will not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in paragraph 6.18 or in the case of uncovering Work as provided in paragraph 13.03.

10.04 CHANGE OF CONTRACT PRICE

A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price will comply with the provisions of paragraph 10.06. Any Claim for an adjustment of Contract Price will comply with the provisions of paragraph 11.01.

B. An adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by Unit Prices contained in the Contract Documents, then by application of such Unit Prices to the quantities of the items involved (subject to the provisions of paragraph 12.03); or

2. where the Work involved is not covered by Unit Prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with paragraph 10.04.C.2); or

3. where the Work involved is not covered by Unit Prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in paragraph 12.01) plus a Contractor's fee for overhead and profit (determined as provided in paragraph 10.04.C).

C. Contractor's Fee: When applicable, Contractor's fee for overhead and profit will be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

    a. for costs incurred under paragraph 12.01.B.1 and 12.01.B.2, Contractor's fee will be 15 percent;

    b. for costs incurred under paragraph 12.01.B.3, Contractor's fee will be five percent;

    c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of paragraphs 10.04.C.2.a and 10.04.C.2.b is that Contractor's fee will be based on:

        1) a fee of 15 percent of the costs incurred under paragraphs 12.01.B.1 and 12.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and

        2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor;

        3) provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;

    d. no fee will be payable on the basis of costs itemized under paragraphs 12.01.B.4, 12.01.B.5, and 12.01.C;

    e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to 5 percent of such net decrease; and

    f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee will be computed on the basis of the net change in accordance with paragraphs 10.04.C.2.a through 10.04.C.2.e, inclusive.

10.05 CHANGE OF CONTRACT TIMES

A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times will comply with the provisions of paragraph 10.06. Any Claim for an adjustment in the Contract Times will comply with the provisions of paragraph 11.01.

B. An adjustment of the Contract Times will be subject to the limitations set forth in paragraph 12.04, concerning delays in Contractor's progress.

10.06 CHANGE PROPOSALS

A. Contractor will submit a Change Proposal to Landscape Architect to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Landscape Architect concerning the requirements of the Contract Documents or relating to the acceptability of the

Work under the Contract Documents; contest a set-off against payment due; or seeking other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

1. Procedures: Contractor will submit each Change Proposal to Landscape Architect promptly (but in no event later than 5 days) after the start of the event giving rise thereto, or after such initial decision. Contractor will submit supporting data, including the proposed change in Contract Price or Contract Time (if any) to Landscape Architect and Owner within 15 days after the submittal of the Change Proposal. The supporting data will be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Landscape Architect will advise Owner regarding the Change Proposal and consider any comments or response from Owner regarding the Change Proposal.

2. Landscape Architect's Action: Landscape Architect will review each Change Proposal and, within 30 days after receipt of Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions will be in writing, with a copy provided to Owner and Contractor. If Landscape Architect does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Landscape Architect's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under paragraph 11.01.

3. Binding Decision: Landscape Architect's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under paragraph 11.01.

B. Resolution of Certain Change Proposals: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Landscape Architect will notify the parties that Landscape Architect is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of paragraph 11.01.

10.07 EXECUTION OF CHANGE ORDERS

A. Owner and Contractor will execute appropriate Change Orders covering:

1. changes in the Contract Price or Contract Times which are agreed to by the Parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;

2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;

3. changes in the Work which are:

a. ordered by Owner pursuant to paragraph 10.02,

b. required because of Owner's acceptance of defective Work under paragraph 13.08 or Owner's correction of defective Work under paragraph 13.09, or

c. agreed to by the parties, subject to the need for Landscape Architect's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and

4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under paragraph 10.06, or Article 16.

B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this paragraph 10.07, it will be deemed to be of full force and effect, as if fully executed.

10.08 NOTIFICATION TO SURETY

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 11 CLAIMS

11.01 CLAIMS

A. Claims Process: The following disputes between Owner and Contractor will be submitted to the Claims process set forth in this Article:

1. Appeals by Owner or Contractor of Landscape Architect's decisions regarding Change Proposals;

2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and

3. Disputes that Landscape Architect has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.

B. Submittal of Claim: The party submitting a Claim will deliver it directly to the other party to the Contract promptly (but in no event later than 10 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim will also furnish a copy to Landscape Architect, for its information only. The responsibility to substantiate a Claim will rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor will certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. Review and Resolution: The party receiving a Claim will review it thoroughly, giving full consideration to its merits. The two parties will seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim

by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Landscape Architect.

D. Mediation:

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.

2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor will each pay one-half of the mediator's fees and costs.

E. Partial Approval: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 16 for final resolution of disputes.

F. Denial of Claim: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 16 for final resolution of disputes.

G. Final and Binding Results: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 12 COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

12.01 COST OF WORK

A. Purposes for Determination of Cost of the Work: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this paragraph 12.01 are used to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

B. Costs Included: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those prevailing in the locality of the Project, will not include any of the costs itemized in paragraph 12.01.C, and will include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees will include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs will include, but not be limited to, salaries and wages plus the cost of fringe benefits, which will include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.

2. Costs of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts will accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor will make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor will obtain competitive bids from Subcontractors acceptable to Owner and Contractor and will deliver such bids to Owner, who will then determine, with the advice of Landscape Architect, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this paragraph 12.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

    a. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

    b. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Landscape Architect, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts will cease when the use thereof is no longer necessary for the Work.

        1) The rental rate established for each piece of Contractor owned equipment, including appurtenances and attachments to the equipment, used will be determined by use of the Rental Rate Blue Book for Construction Equipment,

Volume 1, 2 or 3, as applicable; the edition which is current at the time the Work was started will apply. The established rental rate will be equal to the “Monthly” rate divided by 176; modified by the rate adjustment factor and the applicable map adjustment factor, plus the “Estimated Operating Costs per Hour.”

2) For equipment not listed in the Rental Rate Blue Book, Volume 1, 2 or 3, the rental rate will be determined by using the rate listed for a similar piece of equipment or by proportioning a rate listed so that the capacity, size, horsepower, and age are properly considered.

3) For equipment for which there are no comparables in the Rental Rate Blue Book, Volume 1, 2 or 3, the monthly rate will be reasonable, but not more than 5 percent of the current list price, or invoice, of the equipment. The base hourly rate will then be determined by dividing the monthly rate by 176 to which 20 percent will be added to the sum which will account for adjustments and operating costs.

c. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by laws and regulations.

d. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

e. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with paragraph 5.03), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses will include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining:

1) The cost of utilities, fuel, and sanitary facilities at the Site.

2) The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. Costs Excluded: The term Cost of the Work will not include any of the following items:

1. Payroll costs and other compensation of Contractor’s officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor’s principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 12.01.B.1 or specifically covered by paragraph 12.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by Contractor’s fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraph 12.01.B.

D. Contractor's Fee: When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee will be determined as set forth in paragraph 10.04.C.

E. Documentation: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 12, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Landscape Architect on a daily basis, an itemized cost breakdown together with supporting data.

12.02 ALLOWANCES

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and will cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Landscape Architect.

B. Cash Allowances: Contractor agrees that:

1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. Contractor's costs for unloading and handling of the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. Contingency Allowance: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Landscape Architect to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price will be correspondingly adjusted.

12.03 UNIT PRICE WORK

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Proposal.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

C. Each Unit Price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Landscape Architect will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Landscape Architect will review Landscape Architect's preliminary determinations with Contractor on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Landscape Architect's written decision thereon will be final and binding (except as modified by Landscape Architect to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph 12.03.E.

E. Within 30 days of Landscape Architect's written decision under the preceding paragraph 12.03.D, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking and adjustment in the Contract Price if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimate quantity of such item indicated in the Proposal (in no event will any change in quantities of less than 25% be considered a material or significant change from the estimated quantities); and

2. there is no corresponding adjustment with respect to any other item of Work.

12.04 DELAYS IN CONTRACTOR'S PROGRESS

A. If Owner, Landscape Architect, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor will be entitled to request an equitable adjustment in the Contract Times and Contract Price. However, Contractor's entitlement to an adjustment of the Contract Times or Contract Price is expressly conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

B. Contractor will not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier will be deemed to be within the control of Contractor.

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor will be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include only the following:

1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;

2. acts or failures to act of utility owners (other than those performing other works at or adjacent to the Site by arrangement with Owner, as specified in paragraph 7.01); and

3. acts of war or terrorism.

D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:

1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.

2. Contractor will not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor will not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.

3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 10.

E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:

1. The circumstances that form the basis for the requested adjustment;

2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;

3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;

4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and

5. The impact on Contract Price, in accordance with the provisions of paragraph 10.04.

F. Contractor will also furnish such additional supporting documentation as Owner or Landscape Architect may require including, where appropriate, a revised Progress Schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.

G. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by paragraphs 4.03 and 4.06.

H. Paragraph 7.01 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

I. Contractor will not be entitled to any adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.

J. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 5 days of the commencement of the delaying, disrupting, or interfering event.

K. Where Contractor is prevented from completing any part of the Work within the Contract Time (or Milestones) due to delay beyond the control of both Owner and Contractor, an extension of the Contract Times (or Milestones) in an amount equal to the time lost due to such delay will be Contractor's sole and exclusive remedy for such delay. In no event will Owner or Landscape Architect be liable to Contractor, any Subcontractor, any Supplier, or any other person or organization, or to any surety or employee or any agent of them, for damages, including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs, arising out of or resulting from:

1. delays caused by or within the control of Contractor (or Subcontractor or Supplier);

2. delays beyond the control of both Owner and Contractor, including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God, or acts of neglect by utility owners or other contractors performing other work;

L. Nor will Owner or Landscape Architect or each of them be liable to Contractor for any claims, costs, losses or damages sustained by Contractor on or in connection with any other project or anticipated project.

M. Nothing in this paragraph 12.04 bars a change in Contract Price to compensate Contractor due to delay, interference, or disruption directly attributable to actions or inactions of Owner or anyone for whom Owner is responsible. Except for an adjustment to the Contract Times and Contract Price, Contractor will not be entitled to and hereby waives any and all damages that it may suffer by reason of such delay or for any Act of God, including but not limited lost profits, overhead, and other consequential damages.

ARTICLE 13 TESTS AND INSPECTION; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 ACCESS TO WORK

A. Owner, Landscape Architect and Landscape Architect's representatives, other representatives of Owner, testing agencies and governmental agencies with jurisdictional interests will have access to the Work at reasonable times for their observation, inspection and testing. Contractor will provide proper and safe conditions for such access and advise Owner and Landscape Architect of Contractor's Site safety procedures and programs so that Owner and Landscape Architect may comply therewith as applicable.

13.02 TESTS AND INSPECTIONS

A. Contractor will give Landscape Architect and testing agency at least 24-hour notice, unless otherwise specified, of readiness of the Work for all required inspections, tests or approvals, and will cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. If any Law and Regulation, code, or order of any public body having jurisdiction requires any Work or part thereof to specifically be inspected, tested or approved, Contractor will assume full responsibility therefor, pay all costs in connection therewith and furnish Landscape Architect the required certificates of inspection, testing or approval.

C. Contractor will also be responsible for and will pay all costs in connection with any inspection or testing required in connection with Owner's or Landscape Architect's acceptance of a manufacturer, fabricator, Supplier or distributor of materials or equipment proposed to be incorporated in the Work, or of materials or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

D. The cost of all other inspections, tests and approvals required by the Contract Documents will be paid by Owner unless otherwise specified.

E. All inspections, tests or approvals other than those required by law, ordinance, rule, regulation, code or order of any public body having jurisdiction will be performed by organizations acceptable to Owner and Contractor or by Landscape Architect if so specified.

F. Cost of materials to be used in inspection and transportation costs will be paid for by Contractor.

G. Neither observations by Landscape Architect nor inspections, tests or approvals by others will relieve Contractor from Contractor's obligations to perform the Work in accordance with the Contract Documents.

13.03 UNCOVERING WORK

A. If any Work that is to be tested, inspected or approved is covered without written concurrence of Landscape Architect, or contrary to the written request of Landscape Architect, it will, if requested by Landscape Architect, be uncovered by Contractor for Landscape Architect's observation. Such uncovering will be at Contractor's expense unless Contractor has given Landscape Architect timely written notice of Contractor's intention to cover such Work and Landscape Architect has not acted with reasonable promptness in response to such notice.

B. If Landscape Architect considers it necessary or advisable that covered Work be observed by Landscape Architect or inspected or tested by others, Contractor, at Landscape Architect's request, will uncover, expose or otherwise make available for observation, inspection or testing as Landscape Architect may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment. Except as otherwise specified in paragraph 13.04, the cost of Work will be paid for as follows:

1. If it is found that such Work is defective, Contractor will bear all the expenses of such uncovering, exposure, observation, inspection and testing, and of satisfactory reconstruction, (including, but not limited to, fees and charges of engineers, architects, attorneys, and other professionals) and an appropriate deductive Change Order will be issued. If the parties are unable to agree as to the amount or extent of any change in Contract Price or Contract Time, Owner may make a Claim as provided in paragraph 11.01.

2. If, however, such Work is not found to be defective, Contractor will be allowed an increase in the Contract Price or an extension of the Contract Time or both, directly attributable to such uncovering, exposure, observation, inspection, testing, and reconstruction. If the parties are unable to agree as to the amount or extent of any change in Contract Price or Contract Time, Contractor may make a Claim as provided in paragraph 11.01.

13.04 DEFECTIVE WORK

A. Contractor’s Obligation: It is Contractor’s obligation to assure that the Work is not defective.

B. Landscape Architect's Authority: Landscape Architect has the authority to determine whether Work is defective, and to reject defective Work.

13.05 OWNER MAY STOP THE WORK

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 CORRECTION OR REMOVAL OF DEFECTIVE WORK

A. If required by Landscape Architect or Owner, Contractor will promptly either correct all defective Work, whether or not fabricated, installed or completed, or if the Work has been rejected by Landscape Architect, remove it from the Site and replace it with non-defective Work. Contractor will pay all claims, costs, losses, damages and expenses caused by or resulting from such correction or removal (including, but not limited to all costs of repair or replacement of work of others) and will take no action that would void or otherwise impair Owner's special warranty or guarantee, if any, on such Work.

13.07 GUARANTEE PERIOD

A. If within 1 year after the date of Substantial Completion (or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents), or by any specific provision of the Contract Documents, any Work is found to be defective, Contractor will promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair defective land or areas;
2. correct such defective Work;
3. if the defective Work has been rejected by Owner, remove it from the Site and replace it with Work that is not defective, and
4. satisfactorily correct or repair or remove and replace any damage to other Work or the work of others or other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or the rejected Work removed and replaced, and all claims, costs, losses, damages and expenses caused by or resulting from such removal and replacement (including but not limited to all costs of repair or replacement or work of others) will be paid by Contractor.

C. Repair or replacements made under the guarantee will bear an additional 1 year guarantee dated from the acceptance of repair or replacement.

13.08 ACCEPTANCE OF DEFECTIVE WORK

A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Landscape Architect's recommendation of final payment, also Landscape Architect)

prefers to accept it, Owner may do so. Contractor will pay all claims, costs, losses, damages and expenses attributable to Owner’s evaluation of and determination to accept such defective Work (such costs to be approved by Landscape Architect as to reasonableness). In such case, if acceptance occurs prior to Landscape Architect's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner will be entitled to an appropriate reduction in the Contract Price. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 OWNER MAY CORRECT DEFECTIVE WORK

A. If Contractor fails within a reasonable time after written notice from Landscape Architect to correct defective Work, or to remove and replace rejected Work as required by Landscape Architect in accordance with paragraph 13.06, or if Contractor fails to perform the Work in accordance with the Contract Documents (including any requirements of the Progress Schedule), Owner may, after 48 hours' written notice to Contractor and Contractor's Surety without prejudice to any other remedy Owner may have, correct and remedy any such deficiency.

B. In exercising Owner's rights and remedies under this paragraph 13.09, Owner will proceed expeditiously. To the extent necessary to complete corrective and remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work, and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor will allow Owner, Owner's representatives, agents and employees, Owner’s other contractors, and Landscape Architect’s consultants such access to the Site as may be necessary to enable Owner to exercise Owner's rights and remedies under this paragraph 13.09.

C. All claims, costs, losses, damages and expenses incurred or sustained by Owner in exercising such rights and remedies will be charged against Contractor and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work. Owner will be entitled to an appropriate reduction in the Contract Price equivalent to such claims, costs, losses, damages and expenses including but not be limited to all costs of repair or replacement of work of others destroyed or damaged by correction, removal or replacement of Contractor’s defective Work.

D. Contractor will not be allowed an extension of the Contract Time because of any delay in performance of the Work attributable to the exercise by Owner of Owner's rights under this Article 13.

ARTICLE 14 PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 SCHEDULES

A. At least 10 days prior to submitting the first Application for Payment, Contractor will submit to Landscape Architect a final Schedule of Submittals, and, where applicable, a Schedule of Values for the Work. These schedules will be satisfactory in form and substance to Landscape Architect as provided in Article 2.

B. The Schedule of Values will include quantities and unit prices aggregating the Contract Price and will subdivide the Work into component parts. Each unit cost so established will include its proportionate share of Contractor's general operating charges such as profit, overhead, supervision, insurance, bond premiums, interest, equipment cost, depreciation and rental, contingencies, expendable tools, equipment and supplies. The total cost of the items and quantities Contractor lists in the Schedule of Values will equal the total Contract Price established in the Proposal.

C. The Schedule of Values will include a complete set of detailed work sheets on bid take off and bid summary covering estimated general conditions expense (field overhead), general overhead, profit mark ups and revisions leading to the final bid amount.

D. When the Schedule of Values is approved by Landscape Architect, it will become part of the Agreement and will be used as the basis for Contractor progress payments.

E. Progress payments based upon Unit Price Work will be based upon the number of units completed.

14.02 APPLICATION FOR PROGRESS PAYMENT

A. At least 20 days before each Application for Payment falls due (but not more often than once a month), Contractor will submit to Landscape Architect for review an Application for Payment, Contractor's Declaration, Payment Schedule, and updated Progress Schedules indicating the anticipated completion dates of the various stages of the Work and estimated payments during the next 3 months. Contractor's Application for Payment will be filled out on the form provided in the Contract Documents and signed by Contractor covering the Work completed as of the date of the Application for Payment and accompanied by such supporting documentation as is required by the Contract Documents and as Landscape Architect or Owner may reasonably require. The Payment Schedule will be on the form provided in the Contract Documents or in a format acceptable to Landscape Architect or Owner. On the second and all subsequent payments, partial Waivers of Lien and Sworn Statement will be required for all Work completed and paid for on previous certificates.

B. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment will also be accompanied by such data, satisfactory to Owner, as will establish Owner's title to the material and equipment and protect Owner's interest therein, including applicable insurance. A receipted vendor's invoice showing the quantities of materials and the amounts paid will be required and will accompany the Application for Payment.

C. Retainage with respect to progress payments will be in accordance with paragraph 14.03, and it will be retained until after completion of the entire Work and its final acceptance. When the amount to be retained is reduced to less than 10 percent, Contractor will file with Owner the written consent of the Surety to such reduction and will furnish an affidavit that all Contractor’s indebtedness by reason of the Contract has been paid.

14.03 RETAINAGE

A. On Contracts with a dollar value of $30,000 and greater or on Contracts that provide for more than 3 progress payments, progress payments and retainage will be governed by the provisions of any statutes, rules or regulations regarding retention and these are incorporated herein by reference and made a part of this Contract.

B. If there are no statutes, rules, or regulations applicable to retention, retainage will be 10%, or such an amount as Owner deems necessary.

14.04 REVIEW OF APPLICATIONS FOR PROGRESS PAYMENT

A. Landscape Architect will, within 10 days after receipt of each Contractor's Application for Payment and Payment Schedule, including each resubmittal, either indicate in writing a recommendation of payment and present an Engineer's Certificate for Payment to Owner, or may return the Application to Contractor indicating in writing Landscape Architect's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

B. Landscape Architect's recommendation of any payment requested in Contractor’s Application for Payment will constitute a representation by Landscape Architect to Owner, based on Landscape Architect's review of the Contractor’s Application for Payment and Certificate for Payment and the accompanying data and schedules, as an experienced and qualified design professional that to the best of Landscape Architect's knowledge, information and belief;

1. the Work has progressed to the point indicated;

2. the quality of the Work is in accordance with the technical aspects of the Contract Documents subject to an evaluation of the Work as a functioning Project upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for any Unit Price Work under paragraph 12.03, and any qualifications stated in the recommendation; and

3. the conditions precedent to Contractor’s being entitled to such payment appear to have been fulfilled in so far as it is Landscape Architect’s responsibility to observe the Work.

C. However, by recommending any such payment Landscape Architect will not thereby be deemed to have represented that:

1. exhaustive or continuous on-Site inspections have been made to check the quality or the quantity of the Work; or

2. involved detailed inspections of the Work beyond the responsibilities specifically assigned to Landscape Architect in the Contract; or

3. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

D. Neither Landscape Architect's review of Contractor’s Work for the purpose of recommending payments nor Landscape Architect’s recommendation of any payment, including final payment, will impose responsibility on Landscape Architect:

1. to supervise, direct or control the Work;

2. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;

3. for the failure of Contractor to comply with Laws and Regulations applicable to the furnishing or performance of Work;

4. for any failure of Contractor to perform or furnish Work in accordance with the Contract Documents;

5. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price;

6. to determine that title to any Work, materials, or equipment has passed to Owner free and clear of Liens.

E. Landscape Architect may refuse to recommend the whole or any part of any payment if, in Landscape Architect's opinion, it would be incorrect to make such representations as stated above to Owner. Landscape Architect may also refuse to recommend any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended to such extent as may be necessary in Landscape Architect's opinion to protect Owner from loss because:

1. the Work is defective, or completed Work has been damaged requiring correction or replacement;

2. the Contract Price has been reduced because of Change Orders;

3. Owner has been required to correct defective Work in accordance with paragraph 1309, or has accepted defective Work in accordance with paragraph 13.08;

4. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

5. Landscape Architect has actual knowledge of the occurrence of any of the events enumerated in paragraph 15.02.

14.05 PAYMENT BECOMES DUE

A. Thirty (30) days after presentation of the Application for Payment to Owner with Landscape Architect's recommendation, the amount recommended will (subject to the provisions of paragraph 14.05.B) become due, (or only if Owner is a public agency, within 15 days after Owner receives the funds which are to be provided by a department or agency of the federal or state government, whichever is later, or in accordance with any time periods required by any applicable statute, rule or regulation) and when due will be paid by Owner to Contractor.

B. Owner may refuse to make payment of the full amount recommended by Landscape Architect because:

1. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries,

2. adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

3. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

4. Contractor has failed to provide and maintain required bonds or insurance;

5. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

6. Owner has incurred extra charges or engineering costs related to Submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;

7. The Work is defective, requiring correction or replacement;

8. Owner has been required to correct defective Work in accordance with paragraph 13.09, or has accepted defective Work pursuant to paragraph 13.08;

9. The Contract Price has been reduced by Change Orders;

10. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;

11. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;

12. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

13. there are other items as set forth in the Contract Documents entitling Owner to a set off against the amount recommended; or

14. Owner has actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.04.E.1 through 14.04.E.5.

C. If Owner refuses to make payment of the full amount recommended by Landscape Architect, Owner will give Contractor immediate written notice (with a copy to Landscape Architect) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner will promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor corrects, to Owner's satisfaction, the reasons for such action. The reduction imposed will be binding on Contractor unless Contractor duly submits a Change Proposal contesting the reduction.

D. If it is subsequently determined that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by paragraph 14.05.

14.06 CONTRACTOR'S WARRANTY OF TITLE

A. Contractor warrants and guarantees that title to all Work, materials and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner at the time of payment free and clear of all Liens, claims, security interests and encumbrances (hereafter in these General Conditions referred to as "Liens").

14.07 SUBSTANTIAL COMPLETION

A. When Contractor considers the entire Work ready for its intended use Contractor will notify Owner and Landscape Architect in writing that the entire Work is substantially complete and request that Landscape Architect issue a Certificate of Substantial Completion. Contractor will

at the same time submit to Owner and Landscape Architect an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor's notification, Owner, Contractor, and Landscape Architect will make an inspection of the Work to determine the status of completion. If Landscape Architect does not consider the Work substantially complete, Landscape Architect will notify Contractor in writing giving the reasons therefor.

C. Once Landscape Architect considers the Work substantially complete, Landscape Architect will deliver to Owner a preliminary Certificate of Substantial Completion which will fix the date of Substantial Completion. Landscape Architect will attach to the certificate a punch list of items to be completed or corrected before final payment. Owner will have 7 days after receipt of the preliminary certificate during which to make written objection to Landscape Architect as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Landscape Architect concludes that the Work is not substantially complete, Landscape Architect will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefore. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Landscape Architect concludes that the Work is substantially complete, then Landscape Architect will, within said 14 days, execute and deliver to Owner and Contractor a final Certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Landscape Architect believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary Certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner will bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

E. After Substantial Completion Contractor will promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

F. Owner will have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

14.08 PARTIAL UTILIZATION

A. Use by Owner of completed portions of the Work may be accomplished prior to Substantial Completion of all the Work subject to the following:

1. Owner at any time may request Contractor in writing to permit Owner to use any part of the Work which Owner believes to be substantially complete and which may be so used without significant interference with construction of the other parts of the Work. If Contractor agrees, Contractor will certify to Owner and Landscape Architect that said part of the Work is substantially complete and request Landscape Architect to issue a certificate

of Substantial Completion for that part of the Work. Within a reasonable time thereafter Owner, Contractor and Landscape Architect will make an inspection of that part of the Work to determine its status of completion.

a. If Landscape Architect does not consider that part of the Work to be substantially complete, Landscape Architect will notify Owner and Contractor in writing giving reasons therefor.

b. If Landscape Architect considers that part of the Work to be substantially complete, Landscape Architect will execute and deliver to Owner and Contractor a certificate to that effect, fixing the date of Substantial Completion for that part of the Work, attaching thereto a punch list of items to be completed or corrected before final payment.

2. Prior to issuing a certificate of Substantial Completion for that part of the Work, Landscape Architect will deliver to Owner and Contractor a written recommendation as to the division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, maintenance, utilities and insurance for that part of the Work, which will become binding upon Owner and Contractor at the time of issuing the definitive certificate of Substantial Completion for that part of the Work unless Owner and Contractor will have otherwise agreed in writing and so informed Landscape Architect.

3. Owner will have the right to exclude Contractor from any part of the Work which Landscape Architect has so certified to be substantially complete, but Owner will allow Contractor reasonable access to complete or correct items on the punch list.

4. In lieu of the issuance of a certificate of Substantial Completion as to part of the Work, Owner may take over operation of a facility constituting part of the Work whether or not it is Substantially Complete if such facility is functionally and separately usable; provided that prior to any such takeover, Owner and Contractor have agreed as to the division of responsibilities between Owner and Contractor for security, operation, safety, maintenance, correction period, heat, utilities and insurance with respect to such facility.

14.09 FINAL INSPECTION

A. Upon written notice from Contractor that the Work is complete, Landscape Architect will make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor will immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.10 FINAL APPLICATION FOR PAYMENT

A. After Contractor has completed all corrections to the satisfaction of Landscape Architect and delivered all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, marked up record documents and other documents (all as required by the Contract Documents), and after Landscape Architect has indicated that the Work is acceptable, subject to the provisions of paragraph 14.13, Contractor may make application for final payment following the procedure for progress payments.

B. The final Application for Payment will be accompanied by all documentation called for in the Contract Documents and such other data and schedules as Landscape Architect may reasonably require, consent of Surety, if any, to final payment, together with complete and

legally effective releases or waivers, satisfactory to Owner, of all Liens arising out of or filed in connection with the Work.

C. In lieu of the releases or waivers of Lien, if approved by Owner, Contractor may furnish receipts or releases in full; an affidavit of Contractor that the releases and receipts include all labor, services, material and equipment for which a Lien could be filed, and that all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner or Owner's property might in any way be responsible, have been paid or otherwise satisfied.

D. If any Subcontractor, manufacturer, fabricator, Supplier or distributor fails to furnish a release or receipt in full, Contractor may furnish a Bond or other collateral satisfactory to Owner to indemnify Owner against any Claim or Lien.

14.11 FINAL PAYMENT AND ACCEPTANCE

A. If, on the basis of Landscape Architect's observation of the Work during construction and final inspection, and Landscape Architect's review of the final Application for Payment and accompanying documentation (all as required by the Contract Documents), Landscape Architect is satisfied that to the best of Landscape Architect’s knowledge, information and belief as a design professional that the Work has been completed and Contractor has fulfilled all of Contractor's obligations under the Contract Documents, Landscape Architect will, within 10 days after receipt of the final Application for Payment, indicate in writing Landscape Architect’s Certificate for Payment and present the application to Owner for payment. At that time Landscape Architect will give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of paragraph 14.13.

B. Otherwise, Landscape Architect will return the Application to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor will make the necessary corrections and resubmit the Application.

C. If the Application and accompanying documentation are appropriate as to form and substance, Owner will, within 45 days (or within the time period required by any applicable statute, rule or regulation) after receipt thereof pay Contractor the amount recommended by Landscape Architect less any amounts of Owner claimed set-offs allowed under the Contract Documents, including but not limited to any applicable liquidated damages as determined by Owner. If Owner rejects the Application, Owner will do so in writing stating the appropriate sections of the Contract Documents upon which the rejection is based. Contractor may take the necessary remedial actions and resubmit the Application.

14.12 FINAL COMPLETION DELAYED

A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Landscape Architect so confirms, Owner will, upon receipt of Contractor's final Application for Payment and recommendation of Landscape Architect, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 5.01, the written consent of the Surety to the payment of the balance due for that portion of the Work fully completed and accepted will be submitted by Contractor to Landscape Architect with the Application for such payment. Such payment will be made under the terms and conditions governing final payment, except that it will not constitute a waiver of Claims.

14.13 WAIVER OF CLAIMS

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to paragraph 14.09, or from failure to comply with the Contract Documents or the terms of any special guarantees specified therein; and will not constitute a waiver by Owner of any rights in respect of Contractor's existing or continuing obligations under the Contract Documents; and,

2. a waiver of all Claims by Contractor against Owner other than those previously made in writing and still pending in accordance with Article 16.

14.14 LATE PAYMENTS

A. Monies not paid when due hereunder, except monies involving Federal and/or State Loans, Grants, or other sources which are delinquent because of no fault of Owner, will bear interest at the maximum rate allowed by law at the time and place of the Project.

ARTICLE 15 SUSPENSION OF WORK AND TERMINATION

15.01 OWNER MAY SUSPEND WORK

A. Owner may, at any time and without cause, suspend the Work or any portion thereof for a period as Owner may deem necessary by notice in writing to Contractor and Landscape Architect. If it should become necessary to stop work for an indefinite period, Contractor will store all materials in such manner that they will not become an obstruction, nor become damaged in any way, and Contractor will take every precaution to prevent damage or deterioration of the Work performed; provide suitable drainage by opening ditches and drains, and erect temporary structures where necessary. Contractor may request an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension if Contractor makes a Claim therefor as provided in paragraph 11.01.

15.02 OWNER MAY TERMINATE FOR CAUSE

A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:

1. Contractor commences a voluntary case under any chapter of the Bankruptcy Code (Title 11, United States Code), as now or hereafter in effect, or if Contractor takes any equivalent or similar action by filing a petition or otherwise under any other federal or state law in effect at such time;

2. a petition is filed against Contractor under any chapter of the Bankruptcy Code as now or hereinafter in effect at the time of filing, or if a petition is filed seeking any such equivalent or similar relief against Contractor under any other federal or state law in effect at the time relating to bankruptcy or insolvency;

3. Contractor makes a general assignment for the benefit of creditors;

4. a trustee, receiver, custodian or agent of Contractor is appointed under applicable law or under contract, whose appointment or authority to take charge of property of Contractor is for the purpose of enforcing a Lien against such property or for the purpose of general administration of such property for the benefit of Contractor's creditors;

5. Contractor admits in writing an inability to pay its debts generally as they become due;

6. Contractor persistently fails to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under paragraph 2.05 as revised from time to time);

7. Contractor disregards Laws and Regulations of any public body having jurisdiction;

8. Contractor disregards the authority of Landscape Architect or Owner; or,

9. Contractor otherwise violates any provisions of the Contract Documents.

B. Owner may, after giving Contractor (and the Surety, if there be one) 7 days' written notice, and to the extent permitted by Laws and Regulations, terminate the services of Contractor, exclude Contractor from the Site, take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the site and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion), incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, finish the Work as Owner may deem expedient, and/or enforce the rights available to Owner under any applicable Performance Bond.

C. In such case, Contractor will not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, damages and expenses sustained by Owner arising out of or resulting from completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, damages and expenses exceed such unpaid balance, Contractor will pay the difference to Owner. Such claims, costs, losses, damages and expenses incurred by Owner will be reviewed as to reasonableness by Landscape Architect and when so approved, incorporated in a Change Order, but when exercising any rights or remedies under this paragraph, Owner will not be required to obtain the lowest price for the Work performed.

D. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor or its Surety then existing or which may thereafter accrue. Any retention or payment of monies due Contractor by Owner will not release Contractor from liability.

15.03 TERMINATION FOR CONVENIENCE

A. Upon 7 days' written notice to Contractor and Landscape Architect, Owner may, without cause and without prejudice to any other right or remedy, elect to terminate the Agreement. In such case, Contractor will be paid (without duplication of any items):

1. for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination;

2. for actual expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials or equipment as required by the Contract Documents in connection with uncompleted Work; and

3. for reasonable expenses directly attributable to protecting work as a result of termination.

B. Contractor will not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

C. Upon such termination, Contractor will:

1. Immediately discontinue Work on the date and to the extent specified in the notice except to the extent necessary to protect Work in place;

2. Place no further orders for materials, services, or facilities, other than as may be necessary or required for completion of such portion of Work under the Contract that is not terminated;

3. Promptly make every reasonable effort to obtain cancellation upon terms reasonably satisfactory to Owner of all purchase orders and subcontracts to the extent they relate to the performance of Work terminated or assign to Owner those orders and subcontracts and revoke agreements specified in such notice;

4. Reasonably assist Owner, as specifically requested in writing, in the maintenance, protection and disposition of property acquired by Owner under the Contract Documents, as may be necessary;

5. Complete performance of any Work which is not terminated; and

6. Deliver to Owner an affidavit regarding the identity of potential unpaid Subcontractors or Suppliers and the amounts due to each.

15.04 CONTRACTOR MAY STOP WORK OR TERMINATE

A. If Owner has failed to pay Contractor any sum finally determined to be due in accordance with the time limits specified in paragraph 14.05, Contractor may upon 7 days' written notice to Owner and Landscape Architect, stop the Work until payment of all amounts then due.

B. If through no act or fault of Contractor, the Work is suspended for a period of more than 90 days by Owner, or under an order of court or other public authority, then Contractor may, upon 7 days written notice to Owner and Landscape Architect and provided Owner or Landscape Architect does not remedy such suspension or failure within that time, terminate the Agreement and recover from Owner payment on the same terms as provided in paragraph 15.03.

C. The provisions of this paragraph 15.04 will not relieve Contractor of Contractor's obligations under paragraph 6.22 to carry on the Work in accordance with the Progress Schedule and without delay during disputes and disagreements with Owner.

ARTICLE 16 FINAL RESOLUTION OF DISPUTES

16.01 METHODS AND PROCEDURES

A. Disputes Subject to Final Resolution: The following disputed matters are subject to final resolution under the provisions of this Article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and

2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents and arising after final payment has been made.

B. Final Resolution of Disputes: For any dispute subject to resolution under this Article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or

2. agree with the other party to submit the dispute to another dispute resolution process; or

3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, the following dispute resolution process will be followed:

a. The parties will submit the dispute to mediation under the mediation procedures outlined in the Construction Industry Arbitration Rules and Mediation Procedures of the American Arbitration Rules.

b. If the dispute is not resolved by mediation, the parties will proceed to resolve the dispute by arbitration in accordance with the Construction Industry Arbitration Rules and Mediation Procedures of the American Arbitration Association. The decision of the arbitrator(s) will be final and binding and is enforceable in a court of competent jurisdiction.

ARTICLE 17 MISCELLANEOUS

17.01 GIVING NOTICE

A. Whenever any provision of the Contract Documents requires the giving of written notice to Owner, Landscape Architect, or Contractor, it will be deemed to have been validly given only if delivered:

1. in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended;

2. by registered or certified mail postage prepaid to, the last business address known to the giver of the notice;

3. or delivered in person to such person by a commercial courier service or otherwise to the recipient’s place of business; or

4. by secure file transfer with receipt documentation or other document control software.

17.02 COMPUTATION OF TIME

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday, or on a day made a legal holiday by the Law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 GENERAL

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and will not be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Law or Regulation, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this paragraph will be as

effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply.

B. All representations, warranties and guarantees made in the Contract Documents will survive final payment and termination or completion of this Agreement.

17.04 PROFESSIONAL FEES AND COURT COSTS INCLUDED

A. Whenever reference is made to “claims, costs, losses, damages and expenses,” it will include in each case, but not be limited to, all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs.

17.05 NONDISCRIMINATION OF EMPLOYMENT

A. Contractor will agree not to discriminate against any employee or applicant for employment, to be employed in the performance of this Contract, with respect to Contractor's hire, tenure, terms, conditions or privileges of employment, or any matter directly or indirectly related to employment, because of race, color, sex, age, religion, national origin or ancestry, height, weight, or marital status, or any other classification protected by law, and to require a similar covenant on the part of any Subcontractor employed in the performance of the Contract.

17.06 POST COMPLETION DATE ENGINEERING AND INSPECTION COSTS

A. All engineering and inspection costs incurred after the specified completion date will be paid by Contractor to Owner prior to final payment authorization. However, Contractor will not be charged with any post completion date engineering and inspection costs when the delay in completion of the Work is due to the following and Contractor has promptly given written notice of such delay to Owner or Landscape Architect:

1. to any preference, priority or allocation order duly issued by Owner;

2. to unforeseeable causes beyond the control and without the fault or negligence of Contractor, including but not restricted to, acts of God, or of the public enemy, acts of Owner, acts of another contractor in the performance of a Contract with Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and abnormal and unforeseeable weather; and,

3. to any delays of Subcontractors or Suppliers occasioned by any of the causes specified in this Article.

B. Charges after the specified completion date will be made at such times and in such amounts as Landscape Architect will invoice Owner, provided, however said charges will be in accordance with Landscape Architect's current rate schedule at the time the costs are incurred. Engineering and inspection costs so incurred will be deducted from Contractor's progress payments.

17.07 WAIVER OF CONSEQUENTIAL DAMAGES

A. Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract or the Work. This mutual waiver includes but is not limited to:

1. damages incurred by Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

2. damages incurred by Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit in connection with any other project or anticipated project.

B. This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination or default. Nothing contained in this Section will be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents. Contractor also waives any Claim for consequential damages against Landscape Architect where such Claims arise out of or relate in any way to the Project or the Contract Documents.

17.08 NO WAIVER

A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

17.09 CONTROLLING LAW

A. This Contract is to be governed by the Law of the state in which the Project is located.

17.10 HEADINGS

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

END OF SECTION

SECTION 00 73 00 - SUPPLEMENTARY CONDITIONS

PART 1 GENERAL

1.01 SUMMARY

A. These Supplementary Conditions amend and supplement Section 00 72 00 - General Conditions and other provisions of Contract Documents as indicated below. Provisions that are not so amended or supplemented remain in full force and effect.

B. The terms used in these Supplementary Conditions that are defined and have the meanings assigned to them in Section 00 72 00 - General Conditions.

1.02 MODIFICATIONS TO GENERAL CONDITIONS

A. **SGC-1.01 Defined Terms**

1. The definition for "As-Built Drawings" in Section 00 72 00 - General Conditions will be added as follows:

   As-Built Drawings -- Revised construction documents prepared by the Contractor that reflect all modifications made during the construction process. These include changes due to material availability, constructability issues, or design optimizations. These drawings serve as a contractual record to prove compliance with project requirements.

2. The definition for "As-Built Drawings" in Section 00 72 00 - General Conditions will be added as follows:

   Record Drawings -- Clean, finalized sets of drawings compiled by the Landscape Architect using the Contractor’s as-built drawings and they incorporate all approved changes into the original design documents and represent the project’s final state as documented; these drawings may not be based on field verification.

3. The definition for “Substantial Completion” in Section 00 72 00 - General Conditions will be revised as follows:

   Substantial Completion -- The Work (or a specified part thereof) has progressed to the point where, in the opinion of the Landscape Architect as evidenced by the Certificate of Substantial Completion, it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it was intended; or if no such certificate is issued, when the Work is complete and ready for final payment as evidenced by the Landscape Architect’s written recommendation of final payment in accordance with Article 14.11 of Section 00 72 00 - General Conditions. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

B. **SGC-4.02 Subsurface and Physical Conditions; Investigations and Reports**

1. In the preparation of Plans and Specifications, the Landscape Architect has relied upon the following reports and tests of subsurface and latent physical conditions at the site or otherwise affecting cost, progress or performance of the Work: _____

2. Copies of the following reports and/or tests are attached as Exhibits: _____

C. **SGC-4.05 Reference Points**

1. Delete Article 4.05 of Section 00 72 00 - General Conditions and replace it with the following:

   Contractor will be responsible for the preservation of established reference points and will make no changes or relocations without the prior written approval of Owner. Contractor will report to Landscape Architect whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations. Reference points destroyed by negligence of Contractor will be replaced by Owner at the expense of Contractor. Construction Staking will be furnished by Contractor as provided in Division 01 of the Specifications.

D. **SGC-5.03 Additional Insured**

1. Add the following language as a new Article 5.03.A.9 of Section 00 72 00 - General Conditions:

   East Bay Charter Township, Wade Trim, Wade Trim 's Subconsultant(s), and _____, and any other person or entity required to be named as an additional insured under the Contract Documents, including each of the aforementioned's respective parent companies, affiliates, subsidiaries, officers, directors, employees, and agents, are required to be designated as additional insureds on all policies of insurance required by Article 5.03 of the Section 00 72 00 - General Conditions and elsewhere in the Contract Documents (except for Worker's Compensation insurance and Professional Liability insurance, unless otherwise specifically required by the Contract Documents).

E. **SGC-5.04 Limits of Liability**

1. The required limits of liability for insurance coverages requested in Article 5.03 of Section 00 72 00 - General Conditions will be not less than the following:

   SGC-5.04.A Worker's Compensation

   Coverage A – Compensation: Statutory

   Coverage B – Employer's Liability

   Each Accident: $100,000

   Disease – Policy Limit: $100,000

   Disease – Each Employee: $100,000

   SGC-5.04.B Comprehensive General Liability

   General Aggregate: $1,000,000

   Products – Com/Ops Aggregate: $1,000,000

   Personal and Advertising Injury: $500,000

   Each Occurrence: $500,000

   Fire Damage (any one fire): $50,000

   Medical Expense (any one person): $5,000

SGC-5.04.C Comprehensive Automobile Liability

Bodily Injury: $500,000

Property Damage: $200,000

or combined single limit: $1,000,000

SGC-5.04.D Owner's Protective

General Aggregate:$1,000,000

Each Occurrence: $1,000,000

SGC-5.04.E Builder's Risk-Installation Floater

Cost to Replace at Time of Loss

SGC-5.04.F Umbrella or Excess Liability: $2,000,000

F. **SGC- 12.04 Lump Sum Work**

1. Add the following new paragraph after Article 12.03 of Section 00 72 00 - General Conditions, which is to read as follows:

12.04 LUMP SUM WORK

a. When additional work or deletion of work, which is covered by a lump sum item, is required due to a modification, not a normal overrun or underrun in estimated quantities, payment or credit for the work will be based upon apparent unit prices which will be derived by dividing the lump sum price by the estimated plan quantities.

b. Renumber subsequent paragraphs accordingly.

G. **SGC-18 Liquidated Damages**

1. Liquidated damages, if applicable, are referenced in the Proposal and Agreement. The requirements for liquidated damages should be included herein.

ARTICLE 18 LIQUIDATED DAMAGES

a. If the Contractor fails to Substantially Complete the Work within the Contract Time, or extension of time granted by the Owner, then the Contractor will pay to the Owner the amount for liquidated damages as specified in the Agreement for each calendar day that the Contractor will be in default after the time stipulated in the Contract Documents. The liquidated damages charged will be deducted from the Contractor's progress payments.

b. Contractor will not be charged with liquidated damages or any excess cost when the delay in Substantial Completion of the Work is due to the following and the Contractor has given written notice of such delay within seven (7) calendar days to Owner or Landscape Architect.

c. To any preference, priority or allocation order duly issued by the Owner.

d. To unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to, acts of God, or of the public enemy, acts of

the Owner, acts of another Contractor in the performance of a Contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and abnormal and unforeseeable weather; and

e. To any delays of subcontractors occasioned by any of the causes specified in paragraph "a" and "b" of this Article.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 00 91 13
ADDENDUM

To all prospective Bidders and others concerned, YOU ARE HEREBY ADVISED THAT the Contract Documents for the above referenced Project are revised in accordance with the following:

Section	Description of Change
Sheet	**Description of Change**

Attachments to this Addendum:

_____

This Addendum is hereby incorporated into the original Contract Documents for the bidding referred to above and is considered as binding as though originally appearing therein. Receipt of this Addendum must be noted in the place provided in Section 00 42 43 - Proposal, dated _____, 20_____.

SECTION 01 11 00 - SUMMARY OF WORK

PART 1 GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

A. This project includes improvements to Grace Macdonald Park. Proposed improvements include construction of cornhole courts; seating areas and related fire pit and seat walls; and new gas and electrical lines. Additionally, future proposed improvements are shown as budgetary items and include concrete walkways, curbing, basketball court modifications, and the conversion of the athletic field into a dog park

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 33 00 - Submittal Procedures

B. Section 01 50 00 - Temporary Facilities and Controls

1.03 WORK BY OTHERS

A. There is no other work in the Project area, known to the Owner, which would affect this Contract.

1.04 RIGHT-OF-WAY JURISDICTION/PERMITS

A. Soil erosion and sedimentation control is under the jurisdiction of the Grand Traverse County.

B. Contractor will secure any permits required by the agency having jurisdiction, will abide by all rules and regulations of each, and will pay all costs in connection with the permits. Contractor will pay for all permit and inspection fees as the agencies may charge to ensure compliance with their requirements.

1.05 COORDINATION

A. A shutoff notice will be delivered by the Contractor to all affected residences and businesses a minimum of two days before any water main is shut off for construction.

B. Whenever an existing gate valve must be opened or closed, the East Bay Township Water Department will be notified. Valves will be opened or closed only by the East Bay Township Water Department.

C. While both existing and new fire hydrants are in place, the Contractor will clearly mark those hydrants not in service and notify the East Bay Township Fire Department of hydrants not in service.

D. It will be the responsibility of the Contractor to coordinate Contractor's operations and those of the Contractor's subcontractors in such a manner so as to avoid interference and delays in the areas of common construction activities.

1.06 CONTRACTOR’S USE OF PREMISES

A. Contractor will maintain construction operations within the presently existing road rights-of-way and easements throughout the Project area. In the event that the Contractor deems it necessary or advisable to operate beyond the limits of the existing rights-of-way or easements,

Contractor will be responsible for making special written agreements with the property owners and will furnish such copies of agreement to the Owner.

1.07 PHOTOGRAPHS

A. Photographs as specified in Section 01 33 00 - Submittal Procedures will be required for this Project.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 21 00 - ALLOWANCES

PART 1 GENERAL

1.01 GENERAL INFORMATION

A. Contractor will include Allowance(s) listed in the Bid Proposal that will cover work, manufactured equipment or services that will be provided either by Contractor or by others who may be selected by Owner.

B. Work performed under Allowances will be subject to Owner approval and under special terms described herein. Contractor will coordinate and cause the work covered by these Allowances.

C. It is understood that Contractor has included in the Contract Price Allowances so named in the Contract Documents and will cause the work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner.

1.02 REQUIREMENTS

A. Allowances will be administered in accordance with the provisions of the General Conditions of the Contract. Contractor will be required to coordinate this work with the agency involved and pay costs the agency may charge in connection with this work.

B. Thereafter, if the actual price for this work is more or less than the allowance, the Contract Price will be adjusted accordingly by Change Order. The adjustment in Contract Price will be made on the basis of the actual invoice price without additional charge or markups for overhead, insurances, bonds, or any other incidental expenses.

C. Contractor will be responsible for all coordination with the agency involved and for the timely completion of the Work to fit his schedule. Contractor will not be allowed any additional compensation for the failure of the agency involved to meet any schedule.

1.03 RELATED REQUIREMENTS

A. The requirements of Section 00 72 00 and all Division 01 sections will also apply to this work.

1.04 DEFINITIONS

A. Lump Sum Allowance: A monetary sum that includes, as part of the Contract Price, the associated costs and requirements to complete the specified Allowance.

1.05 SUBMITTALS

A. Submit invoices or delivery slips to indicate actual quantities of materials delivered to the Site for use in fulfillment of each Allowance.

1.06 INSTRUCTIONS

A. At the earliest feasible date after Contract Award, Contractor will advise Landscape Architect of the date when the final selection and purchase of each product or system described by an Allowance must be completed in order to avoid delay in performance of the work.

B. When requested by Landscape Architect, Contractor will obtain Bids for each Allowance for use in making final selections; include recommendations that are relevant to performance of the Work.

C. Contractor will purchase products and systems as selected by Landscape Architect from the designated Supplier.

D. Allowances will be used only as directed for Owner's purposes, and only by Change Orders which designate amounts to be charged to the Allowance.

E. If the actual price for the specified Allowance is more or less than the stated Allowance, the Contract Price will be adjusted accordingly by Change Order. The adjustment in Contract Price will be made in accordance with the General Conditions.

F. At Project closeout, any amounts remaining in Allowances will be credited to Owner by Change Order.

1.07 SPECIFIC ALLOWANCES

A. Irrigation System with Mainline and Spray Heads:

1. Contractor will coordinate improvements to the irrigation system at this site for this Project. This allowance will be payment in full for labor, materials, and equipment required for furnishing and installing irrigation within the base bid extents of work as shown in the plans, including but not limited to furnishing and setting spray heads, piping, connections, and other items necessary to complete the job, whether specifically mentioned or implied.

2. Contractor will not be allowed any mark ups from the amount invoiced by the irrigation company. The cost for coordination, etc., is not included in this allowance but will be incidental to the Project.

B. Large Dog Play Amenities:

1. Contractor will furnish and install large dog agility items at this site for this Project as specified in the plans. This allowance will be payment in full for labor, materials, and equipment required for furnishing and installing large dog play amenities, including but not limited to furnishing dog agility elements, setting and installing foundations (if required), protection of existing improvements, mulch, and other items necessary to complete the job, whether specifically mentioned or implied.

C. Small Dog Play Amenities:

1. Contractor will furnish and install small dog agility items at this site for this Project as specified in the plans. This allowance will be payment in full for labor, materials, and equipment required for furnishing and installing large dog play amenities, including but not limited to furnishing dog agility elements, setting and installing foundations (if required), protection of existing improvements, mulch, and other items necessary to complete the job, whether specifically mentioned or implied.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

SECTION 01 22 00 - UNIT PRICES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section describes the method of measurement and basis of payment for items of Work included in the Contract and specified in Section 00 42 43 - Proposal. Contractor will provide labor, material, tools, equipment and services required to complete the Work specified herein and indicated on the Plans.

B. The scope and quantity of Work estimated in the Proposal is the best estimate of the Landscape Architect. It is anticipated that the quantity of Work to be completed will vary from the estimated quantities in Section 00 42 43 - Proposal.

C. Owner will make no allowances for items not included in Section 00 42 43 - Proposal.

1.02 ITEMS OF THE PROPOSAL

Item 1, 50, 59, 71, 79

Mobilization will be paid for at the Contract Unit Price on a Lump Sum basis. Price paid will be payment in full for labor, material, and equipment necessary for preparatory work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; for the establishment of Contractor's, Landscape Architect's, and Owner's field offices, and other facilities necessary to undertake the work on the project; and for other work and operations which must be performed, or for expenses incurred, prior to beginning work on the various contract items on the project site. It will also include preconstruction costs, including insurance and bonds, exclusive of bidding costs, which are necessary direct costs to the project and are of a general nature rather than directly attributable to other pay items under the contract. Payment for mobilization will be based upon the following schedule:

Partial Payment Schedule	
Percentage of Original Contract Amount Earned	Percentage of Bid Price for Mobilization Allowed
5	50
10	75
25	100

Item 2

Project Signage will be paid for at the Contract Unit Price on a Lump Sum basis. Price paid will be payment in full for labor, material, and equipment required for furnishing and installing project sign(s) and will include, but is not limited to, installation, sign supports, mounting brackets, hardware, removal of sign at project completion, and other items necessary to complete the job whether specifically mentioned or implied.

Item 3, 20, 34, 61, 73, 81

Soil Erosion and Sedimentation Control will be paid for at the Contract Unit Price on a Lump Sum basis. Price paid will be payment in full for labor, material, and equipment required for furnishing, installing, and maintaining erosion control devices as shown on the

plans or as determined by the Landscape Architect and will include, but is not limited to, furnishing, installing, and maintaining, geotextile silt fence, straw bales, sediment traps, filter bags, establishing permanent erosion control, removal of devices, and other items necessary to complete the job, whether specifically mentioned or implied.

Item 4, 22

Excavation for Concrete, Haul Dirt Off-Site will be paid for at the Contract Unit Price per Cubic Yard (CYD). Price paid will be payment in full for labor, material, and equipment necessary for pavement excavation to the lines and grades shown on the plans, and will include, but is not limited to, stripping and stockpiling topsoil, excavation and disposal of unsuitable material including but not limited to asphalt pavement, deep strength asphalt, asphalt approaches and asphalt drives, aggregate surfaces, sidewalks, concrete end headers, concrete pavement, concrete curbs, concrete approaches and concrete drives, stumps, trees, rocks, earth, large stones, culverts, abandoned utilities, sewers or structures, protecting existing improvements, filling holes and voids with compacted granular backfill, the excavation and disposal of other items exposed in excavating to the subgrade, fine grading and compacting subgrade, sawcutting, barricading, and for other items necessary to complete the work, whether specifically mentioned or implied.

Payment for excavation will be per cubic yard with the quantity of pavement excavation calculated from existing and proposed grades. The quantity paid will be based on plan quantity unless there is a field change which affects plan quantity. No field measurement for payment of pavement excavation will be done at the time of construction.

Items 5

Remove Tree and Stump, Spread Stump Grindings on Site will be paid for at the Contract Unit Price per Each. Price paid will be payment in full for labor, material, and equipment required for removal of existing tree and will include, but is not limited to, excavation, removing and disposing of existing tree, backfilling with soil mixture, restoration, cleanup and other items necessary to complete the job, whether specifically mentioned or implied.

Item 6, 23

Remove Lawn will be paid for at the Contract Unit Price per Square Yard (SYD). Price paid will be payment in full for labor, material, and equipment required for removal of lawn as shown on the plans and will include, but is not limited to, removing and disposing of existing lawn, restoration, cleanup and other items necessary to complete the job, whether specifically mentioned or implied.

Item 7

Remove Stone Adjacent to Parking Lot will be paid for at the Contract Unit Price per Cubic Yard (CYD). Price paid will be payment in full for labor, material, and equipment necessary for the removal of stone, as shown on the Plans or as determined by Landscape Architect, and will include, but is not limited to, removal and disposal of unsuitable materials,tree placing and compacting backfill, protection of existing improvements, barricading, and for other items necessary to complete the job, whether specifically mentioned or implied.

Item 8, 21, 35, 51, 60, 72, 80

Construction Staking will be paid for at the Contract Unit Price on a Lump Sum basis. Price paid will be payment in full for labor, material, and equipment required for construction layout and staking to meet industry standards in line with design as drawn on plans, and other items necessary to complete the Work, whether specifically mentioned or implied.

Item 9, 24, 37, 53, 65, 76, 88

Site Grading will be paid for at the Contract Unit Price on a Lump Sum basis. Price paid shall be payment in full for labor, material, and equipment necessary to grade the site to the lines, grades and cross sections shown on the plans, and shall include, but is not limited to, the removal and disposal of unsuitable material, the excavation and stockpiling of topsoil, grading, shaping, excavating, filling, and compacting the site, the removal and disposal of excess or unsuitable material, the providing of earth and topsoil necessary to conform to the cross sections shown on the Plans, spreading and grading topsoil, removal and disposal of miscellaneous items, and for other items necessary to complete the work, whether specifically mentioned or implied.

Item 10, 25, 105

Allowance, Irrigation System with Mainline and Spray Heads will be paid for at the Contract Unit Price per Lump Sum. Price paid will be payment in full for labor, material, and equipment required for irrigation system within the project area depicted on the plans, and other items necessary to complete the Work, whether specifically mentioned or implied.

Items 11-13, 26-27, 48, 69, 77, 93

Pavement, Concrete of the type and thickness specified will be paid for at the Contract Unit Price per Square Foot (SFT). Price paid will be payment in full for labor, material, and equipment necessary for the concrete pavement and will include, but is not limited to, excavation, construction, protection of existing improvements, furnishing, placing and compacting backfill and subbase, also compacting and fine grading subgrade, also the furnishing and installing of hook bolt assemblies, tie bar assemblies, dowel bar assemblies, contraction joint basket assemblies, expansion joint basket assemblies, polyethylene planks, polystyrene or other fillers, hot-poured elastic joint compound, mesh reinforcement, bar mat reinforcement, also forming, placing, jointing, finishing, texturing and curing the concrete, also providing protection against rain and cold weather, also for barricading, restoration, pavement gapping, part width construction, and other items necessary to complete the job, whether specifically mentioned or implied.

Measurement for concrete pavement will be determined by field measure of concrete in place.

Item 14

Crushed Stone Border will be paid for at the Contract Unit Price per Cubic Yard (CYD). Price paid will be payment in full for labor, material, and equipment required for construction of subbase and will include, but is not limited to stripping and stockpiling topsoil, necessary subgrade preparation, furnishing, hauling, placing and compacting the

subbase material, protection of existing improvements, barricading, and other items necessary to complete the job, whether specifically mentioned or implied.

Measurement for subbase (compacted in place) will be determined by a neat rectangle. The width equal to the width of the pavement measured from back of curb to back of curb plus two (2) feet, or from edge of pavement to edge of pavement plus two (2) feet, and the height as specified on the Plans or as determined by the difference in the elevation of the bottom of the proposed pavement and the top of the subgrade as measured at the centerline of the pavement. The material, placement and compaction required to construct the triangular portions of the subbase, from the top of the subbase at the neat rectangle to the subgrade, will be considered incidental to price paid for subbase (compacted in place). Measurement of subbase material by truck count is not acceptable.

Item 15, 28

Outcropping Stone Wall will be paid for at the Contract Unit Price per Linear Foot (LFT). Price paid will be payment in full for labor, material, and equipment required for construction of outcropping stone wall and base and will include, but is not limited to stripping and stockpiling topsoil, necessary subgrade preparation, furnishing, hauling, placing and compacting the base and subbase material, dewatering, protection of existing improvements, barricading, and other items necessary to complete the job, whether specifically mentioned or implied.

Item 16, 30, 94

Dumor Bench 88, of the type and size indicated on the Plans, will be paid for at the Contract Unit Price per Each . Price paid will be payment in full for labor material and equipment necessary for furnishing and installing bench, and will include, but is not limited to, site preparation, excavation, foundations, installation, hardware, backfill, and other items necessary to complete the Work, whether specifically mentioned or implied.

Item 17, 33

Cornhole Boards, Set of 2, of the type and size indicated on the Plans, will be paid for at the Contract Unit Price per Each . Price paid shall be payment in full for all labor, material, and equipment necessary for preparing the surface where each boa is to be located, including removal and disposal of unsuitable or excess material; aggregate base installation, furnishing and placing each board on a bearing surface that is level; protection of existing improvements; miscellaneous cleanup and restoration, and other items necessary to complete the job, whether specifically mentioned or implied.

Items 18, 32, 46, 55, 78, 107

Landscaping, Seeded Lawn Restoration, will be paid for at the Contract Unit Price per Lump Sum or Square Yard (SYD) of the depth specified. Price paid will be payment in full for labor, material, and equipment necessary to construct the right-of-way to the cross section shown on the Plans or as determined by the Landscape Architect, and will include, but is not limited to excavation, subgrade preparation, filling, shaping, grading, plowing, discing, raking, disposing of unsuitable material and excess material, furnishing fill and topsoil, placing topsoil, seed, fertilizers, and mulch, rolling, tamping, mowing, maintenance and care, and items necessary to complete the job, whether specifically mentioned or implied. Contractor will restore areas disturbed by Contractor's operations.

Measurement for restoration with topsoil, seed, and mulch will be determined by taking the length along the property line, field measured in linear feet, on each side of the proposed pavement, less the driveway width or the pavement width at the intersections. The limits of right-of-way restoration will be as follows:

a. Areas disturbed outside of the limits indicated will be restored at Contractor's expense.

Items 19, 33, 47, 97, 108

Double Shredded Hardwood Mulch of the type specified, will be paid for at the will be paid for at the Contract Unit Price per Cubic Yard (CYD) at the depth specified. Price paid shall be payment in full for all labor material and equipment necessary for furnishing and installing mulch, and shall include, but is not limited to, all preparation, furnishing, placing, spreading, grading, and compacting mulch, and all other items necessary to complete the Work, whether specifically mentioned or implied.

Item 29

Stepping Stones, Base Included, of the type and size indicated on the Plans, will be paid for at the Contract Unit Price per Each . Price paid shall be payment in full for all labor, material, and equipment necessary for preparing the surface where each stone is to be located, including removal and disposal of unsuitable or excess material; aggregate base installation, furnishing and placing each stone on a bearing surface that is level, ensuring each is installed to the line and grade indicated on the Plans; protection of existing improvements; barricading; miscellaneous cleanup and restoration, and other items necessary to complete the job, whether specifically mentioned or implied.

Item 36, 52, 64, 75, 86

Excavation for Concrete Walk and Retaining Wall, Keep Dirt On-Site will be paid for at the Contract Unit Price per Cubic Yard (CYD). Price paid will be payment in full for labor, material, and equipment necessary for pavement excavation to the lines and grades shown on the plans, and will include, but is not limited to, stripping and stockpiling topsoil, excavation and disposal of unsuitable material including but not limited to asphalt pavement, deep strength asphalt, asphalt approaches and asphalt drives, aggregate surfaces, sidewalks, concrete end headers, concrete pavement, concrete curbs, concrete approaches and concrete drives, stumps, trees, rocks, earth, large stones, culverts, abandoned utilities, sewers or structures, protecting existing improvements, filling holes and voids with compacted granular backfill, the excavation and disposal of other items exposed in excavating to the subgrade, fine grading and compacting subgrade, sawcutting, barricading, and for other items necessary to complete the work, whether specifically mentioned or implied.

Payment for excavation will be per cubic yard with the quantity of pavement excavation calculated from existing and proposed grades. The quantity paid will be based on plan quantity unless there is a field change which affects plan quantity. No field measurement for payment of pavement excavation will be done at the time of construction.

Item 38, 49

Techo-Bloc Eva Smooth Pavers, Chestnut Brown will be paid for at the Contract Unit Price per Square Foot (SFT) Price paid will be payment in full for labor, material, and

equipment required for the furnishing and installation of pavers, as shown on the Plans, or as determined by Landscape Architect, and will include, but is not limited to, materials, sub base, removal and disposal of unsuitable materials, furnishing, placing and compacting backfill, protection of existing improvements, barricading, and other items necessary to complete the job, whether specifically mentioned or implied.

Item 39, 66

Techo-Bloc Prescott Seat Wall with Cap, Double-Sided will be paid for at the Contract Unit Price per Linear Foot (LFT) Price paid will be payment in full for labor, material, and equipment required for the furnishing and installation of seat wall, as shown on the Plans, or as determined by Landscape Architect, and will include, but is not limited to, materials, sub base, removal and disposal of unsuitable materials, furnishing, placing and compacting backfill, protection of existing improvements, barricading, and other items necessary to complete the job whether specifically mentioned or implied.

Item 40

Electrical Line, 2" PVC Conduit will be paid for at the Contract Unit Price perLinear Foot (LFT) Li. Price paid will be payment in full for labor, material, and equipment required for the installation of 2" PVC conduit and electrical service, as shown on the Plans, or as determined by Landscape Architect, and will include, but is not limited to, contacting and coordination with utility company, installation of electrical service and related electrical equipment, removal and disposal of unsuitable materials, furnishing, placing and compacting backfill, protection of existing improvements, barricading, and other items necessary to complete the job, whether specifically mentioned or implied.

Item 41

1" Gas Line will be paid for at the Contract Unit Price per Linear Foot (LFT) . Price paid will be payment in full for labor, material, and equipment required for the installation of 1" natural gas service, as shown on the Plans, or as determined by Landscape Architect, and will include, but is not limited to, contacting and coordination with utility company, installation of natural gas and related equipment, removal and disposal of unsuitable materials, furnishing, placing and compacting backfill, protection of existing improvements, barricading, and other items necessary to complete the job, whether specifically mentioned or implied.

Item 42

Exterior Weatherproof Electrical Outlets will be paid for at the Contract Unit Price per Each. Price paid will be payment in full for labor, material, and equipment required for the installation of exterior electrical outlets as shown on the Plans, or as determined by Landscape Architect, and will include, but is not limited to, contacting and coordination with utility company, installation of electrical outlets and related equipment, removal and disposal of unsuitable materials, furnishing, placing and compacting backfill, protection of existing improvements, barricading, and other items necessary to complete the job, whether specifically mentioned or implied.

Item 43

Techo-Bloc Prescott Firepit in Rock Garden, all elements included will be paid for at the Contract Unit Price per Lump Sum Linear. Price paid will be payment in full for labor, material, and equipment required for the installation of firepit as shown on the Plans, or as determined by Landscape Architect, and will include, but is not limited to, contacting and coordination with utility company, installation of natural gas service and related equipment, removal and disposal of unsuitable materials, furnishing firepit, placing and compacting backfill, protection of existing improvements, barricading, and other items necessary to complete the job, whether specifically mentioned or implied.

Item 44

Emergency Gas Shutoff Valve will be paid for at the Contract Unit Price per Each. Price paid will be payment in full for labor, material, and equipment required for the installation of valve as shown on the Plans, or as determined by Landscape Architect, and will include, but is not limited to, contacting and coordination with utility company, furnishing and installation of shutoff vavlve and related equipment, removal and disposal of unsuitable materials, furnishing, placing and compacting backfill, protection of existing improvements, barricading, and other items necessary to complete the job, whether specifically mentioned or implied.

Item 45

Timer Switch for Firepit will be paid for at the Contract Unit Price per Each. Price paid will be payment in full for labor, material, and equipment required for the installation of timer switch as shown on the Plans, or as determined by Landscape Architect, and will include, but is not limited to, contacting and coordination with utility company, furnishing and installation of switch and related equipment, removal and disposal of unsuitable materials, furnishing, placing and compacting backfill, protection of existing improvements, barricading, and other items necessary to complete the job, whether specifically mentioned or implied.

Item 54

Concrete Curb of the type and width specified will be paid for at the Contract Unit Price per Linear Foot (LFT). Price paid will be payment in full for labor, material, and equipment necessary for the concrete curb and gutter section and will include, but is not limited to, excavation, construction, protection of existing improvements, furnishing, placing, and compacting backfill and subbase, compacting and fine grading subgrade, providing and installing hook bolt assemblies, tie bar assemblies, reinforcing steel, also forming, placing, jointing, finishing, texturing and curing the concrete, providing protection against rain and cold weather, backfilling, barricading, restoration, gapping, and other items necessary to complete the job, whether specifically mentioned or implied.

Measurement for concrete curb and gutter will be determined by field measure of curb and gutter in place.

Item 56

Egg Rocks will be paid for at the Contract Unit Price per Cubic Yard (CYD). Price paid will be payment in full for labor, material, and equipment required for construction of egg and will include, but is not limited to stripping and stockpiling topsoil, necessary subgrade preparation, furnishing, hauling, placing and compacting the subbase material, protection

of existing improvements, barricading, and other items necessary to complete the job, whether specifically mentioned or implied.

Measurement for egg rock (compacted in place) will be determined by a neat rectangle. The width equal to the width of the pavement measured from back of curb to back of curb plus two (2) feet, or from edge of pavement to edge of pavement plus two (2) feet, and the height as specified on the Plans or as determined by the difference in the elevation of the bottom of the proposed pavement and the top of the subgrade as measured at the centerline of the pavement. The material, placement and compaction required to construct the triangular portions of the subbase, from the top of the subbase at the neat rectangle to the subgrade, will be considered incidental to price paid for subbase (compacted in place). Measurement of subbase material by truck count is not acceptable.

Item 57

6A Sub Base will be paid for at the Contract Unit Price per Cubic Yard (CYD). Price paid will be payment in full for labor, material, and equipment required for construction of subbase and will include, but is not limited to stripping and stockpiling topsoil, necessary subgrade preparation, furnishing, hauling, placing and compacting the subbase material, protection of existing improvements, barricading, and other items necessary to complete the job, whether specifically mentioned or implied.

Measurement for subbase (compacted in place) will be determined by a neat rectangle. The width equal to the width of the pavement measured from back of curb to back of curb plus two (2) feet, or from edge of pavement to edge of pavement plus two (2) feet, and the height as specified on the Plans or as determined by the difference in the elevation of the bottom of the proposed pavement and the top of the subgrade as measured at the centerline of the pavement. The material, placement and compaction required to construct the triangular portions of the subbase, from the top of the subbase at the neat rectangle to the subgrade, will be considered incidental to price paid for subbase (compacted in place). Measurement of subbase material by truck count is not acceptable.

Item 58

Mirafe Weed Barrier of the type and material specified will be paid for at the Contract Unit Price per Square Foot (SFT). Price paid will be payment in full for labor, material and equipment necessary to furnish and install weed control fabric, and will include, but is not limited to, construction, protection of existing improvements, cutting holes for plants, protection of fabric, repairing torn or damaged fabric, and other items necessary to complete the Work, whether specifically mentioned or implied.

Weed control fabric will be field measured in square yards with no allowance for material in laps or seams.

Item 62

Remove Basketball Hoops, Posts, and Footings will be paid for at the Contract Unit Price per Each. Price paid will be payment in full for removing the basketball hoo, as shown on the plans, or as determined by Landscape Architect, and will include, but is not limited to, the removal of the existing basketball hoop including attached parts and connections; removal and disposal of unsuitable materials; protection of existing

improvements; barricading; and items necessary to complete the job, whether specifically mentioned or implied.

Item 63, 74

Remove Tree and Grind Stumps, Haul Off-Site will be paid for at the Contract Unit Price per Each. Price paid will be payment in full for labor, material, and equipment required for removal of existing tree and will include, but is not limited to, excavation, removing and disposing of existing tree, backfilling with soil mixture, restoration, cleanup and other items necessary to complete the job, whether specifically mentioned or implied.

Item 68

Concrete Stairs, 3 Risers of the size and type shown on the plans will be paid for at the Contract Unit Price on a Lump Sum Lump Sum basis. Price paid will be payment in full for labor, material, and equipment required for constructing the cast-in-place concrete stair structure and will include, but is not limited to, excavation, sheeting, shoring and bracing, dewatering, forming, furnishing, placing, finishing and curing concrete, furnishing and placing reinforcing steel, water stops, embedded items, protection of existing improvements, protection against rain and cold weather, furnishing, placing, and compacting granular backfill, furnishing and installing frame, cover, bricks, blocks, steps, cone section, riser sections, barricading, restoration, and other items necessary to complete the job, whether specifically mentioned or implied.

Item 70

Basketball Hoops with Footings, of the type and size indicated on the Plans, will be paid for at the Contract Unit Price per Each . Price paid will be payment in full for labor material and equipment necessary for furnishing and installing post and hoop, and will include, but is not limited to, site preparation, excavation, foundations, installation, hardware, backfill, and other items necessary to complete the Work, whether specifically mentioned or implied.

Item 83

Remove Benches will be paid for at the Contract Unit Price per Each. Price paid will be payment in full for removing the bench, as shown on the plans, or as determined by Landscape Architect, and will include, but is not limited to, the removal of the bench including attached parts and connections; removal and disposal of unsuitable materials; protection of existing improvements; barricading; and items necessary to complete the job, whether specifically mentioned or implied.

Item 84

Limb-Up Trees to Minimum 6' Ht. will be paid for at the Contract Unit Price per Lump Sum. Price paid will be payment in full for labor, material, and equipment necessary for the complete removal and disposal of tree branches located on trees to remain that are within 6' of the ground in that location. Removal and disposal of limbs and brush will be considered incidental to the Project.

Item 85

Remove Chain-Link Fence will be paid for at the Contract Unit Price per Linear Foot (LFT). Price paid will be payment in full for labor, material, and equipment required for the removal and disposal of the fencing, as shown on the Plans, or as determined by Landscape Architect, and will include, but is not limited to, removal of fencing, gates, and posts, the removal of attached parts and connections, removal and disposal of unsuitable materials, furnishing, placing and compacting backfill, protection of existing improvements, barricading, furnishing and installing temporary fencing, and other items necessary to complete the job, whether specifically mentioned or implied.

Measurement for removal of fence will be determined by field measure of fence removed.

Item 87

Remove Wooden Retaining Wall will be paid for at the Contract Unit Price per Lump Sum. Price paid will be payment in full for labor, material, and equipment required for the removal and disposal of the wall materials, as shown on the Plans, or as determined by Landscape Architect, and will include, but is not limited to, removal of wooden wall, the removal of attached parts and connections, removal and disposal of unsuitable materials, furnishing, placing and compacting backfill, protection of existing improvements, barricading, furnishing and installing temporary fencing, and other items necessary to complete the job, whether specifically mentioned or implied.

Item 89

4' Ht. Chainlink Fence of the type, gauge, and height specified, will be paid for at the Contract Unit Price per Linear Foot (LFT). Price paid will be payment in full for labor, material, and equipment necessary for fencing and will include, but is not limited to, fittings and hardware, excavation, concrete foundations, line posts, end posts, corner posts, angle posts, intersection and intermediate braced posts, rails, tension wire, bracing, post caps, post extensions, barbed wire, fence fabric, gate posts, gates, gate hardware, pickets, stretcher bars, tie wire, fasteners, backfilling, restoration, cleanup and other items necessary to complete the job, whether specifically mentioned or implied.

Measurement for fence will be by linear feet determined by field measurement taken from end to end along the bottom of the installed fencing with no deduction for gate openings.

Item 90-91

Chain Link Gate of the type, gauge, width, and height specified, will be paid for at the Contract Unit Price on a Each basis. Price paid will be payment in full for labor, material, and equipment required for furnishing and installing a gate, as shown on the plans or specified, and will include, but is not limited to, steel framing, steel posts, excavating and setting posts, concrete post foundations, fencing, hardware, bracing, caps, locks, hinges, and other items necessary to complete the job, whether specifically mentioned or implied.

Item 95-96

Allowance. Dog Play Amenities, of the type, size, and location specified on the plans, will be paid for at the Contract Unit Price on a Lump Sum basis. Price paid shall be payment in full for labor, material, and equipment necessary for furnishing and installing equipment and shall include, but is not limited to, excavation, placement, installation, foundations,

hardware, base material, and other items necessary to complete the job, whether specifically mentioned or implied.

Item 98

Water Line Connection with Curb Stop Valve, of the type and size specified will be paid for at the Contract Unit Price on a Linear Foot (LFT) basis. Price paid will be payment in full for labor, material, and equipment necessary for furnishing and installing water piping and valve and will include, but is not limited to, specials and fittings, excavation, sheeting and bracing, shoring, draining, dewatering, laying, jointing, bedding, testing, disinfecting, backfilling (including backfill with special materials where specified), disposal of excess excavated material, temporary blow-offs, thrust blocks, encasement, barricading, connections to existing mains and other items necessary to complete the job, whether specifically mentioned or implied.

Item 99

Sanitary Yard Hydrant will be paid for at the Contract Unit Price per Each. Price paid shall be payment in full for labor, material, and equipment necessary for furnishing and installing hydrant assemblies, and shall include, but is not limited to, valves, valve boxes, connecting piping and fittings, necessary excavation, sheeting and bracing, shoring, dewatering, backfilling, disposal of excess excavated material, miscellaneous pipe connecting hydrant to water main, valves and fittings, thrust blocks, restoration, cleanup, and all other items necessary to complete the job,

Item 100

Crushed Limestone, 6A, of the type and thickness specified on the Plans, will be paid for at the Contract Unit Price per Cubic Yard (CYD). Price paid will be payment in full for labor, material, and equipment necessary for the aggregate base course, compacted in place, and will include, but is not limited to, excavation, construction, protection of existing improvements, furnishing, placing, and compacting backfill and subbase, also compacting and fine grading subgrade, also furnishing and applying chemical additives and water, also for barricading, and for other items necessary to complete the job, whether specifically mentioned or implied.

Measurement for crushed limestone will be in Cubic Yard (CYD), with the installed tonnage determined by certified delivery tickets submitted to Landscape Architect or his duly authorized representative. Delivery tickets will indicate the scale weight of the material, including chemical additives and moisture content. For material having a moisture content in excess of six (6) percent, the excess over six (6) percent will be deducted from the scale weight of the material when the moisture content is six (6) percent. Material placed to conform to the cross section and width specified on the Plans or as determined by Landscape Architect will be paid for at the tonnage basis. If the width of the base course is increased to accommodate Contractor in placing forms, etc., the additional material installed beyond the width specified on the Plans or as determined by Landscape Architect, will be at Contractor's expense.

Item 101-102

Mid Valley Structures Timber Ridge Pavilion with Footings, of the type, size, and location specified on the plans, will be paid for at the Contract Unit Price on a per

Each Each basis. Price paid shall be payment in full for labor, material, and equipment necessary for furnishing and installing equipment and shall include, but is not limited to, excavation, placement, installation, foundations, hardware, base material, and other items necessary to complete the job, whether specifically mentioned or implied.

Item 103-104

Dog-On-It Pet Amenities, of the type, size, and location specified on the plans, will be paid for at the Contract Unit Price on a per Each basis. Price paid shall be payment in full for labor, material, and equipment necessary for furnishing and installing equipment and shall include, but is not limited to, excavation, placement, installation, foundations, hardware, base material, and other items necessary to complete the job, whether specifically mentioned or implied.

Item 106

Sail Shades by Shade Systems Inc with Footings, of the type, size, and location specified on the plans, will be paid for at the Contract Unit Price on a per Each basis. Price paid shall be payment in full for labor, material, and equipment necessary for furnishing and installing equipment and shall include, but is not limited to, excavation, placement, installation, foundations, hardware, base material, and other items necessary to complete the job, whether specifically mentioned or implied.

Items 109-111

Grass and Perennials, of the type and size specified will be paid for at the Contract Unit Price per Each. Price paid will be payment in full for labor, material, and equipment necessary for planting specified plant material(s) and will include, but is not limited to, selection and transporting, protection, hole excavation, pruning, planting, topsoil or planting mixture backfilling, mulching, watering, guying and bracing, wrapping, dressing, warranty of plant material establishment; cleanup and other items necessary to complete the job, whether specifically mentioned or implied.

Items 112

Shrub, of the type and size specified will be paid for at the Contract Unit Price per Each. Price paid will be payment in full for labor, material, and equipment necessary for planting specified plant material(s) and will include, but is not limited to, selection and transporting, protection, hole excavation, pruning, planting, topsoil or planting mixture backfilling, mulching, watering, guying and bracing, wrapping, dressing, warranty of plant material establishment; cleanup and other items necessary to complete the job, whether specifically mentioned or implied.

Items 113-115

Tree, of the type and size specified will be paid for at the Contract Unit Price per Each. Price paid will be payment in full for labor, material, and equipment necessary for planting specified plant material(s) and will include, but is not limited to, selection and transporting, protection, hole excavation, pruning, planting, topsoil or planting mixture backfilling, mulching, watering, guying and bracing, wrapping, dressing, warranty of plant material establishment; cleanup and other items necessary to complete the job, whether specifically mentioned or implied.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 19 - PROJECT MEETINGS

PART 1 GENERAL

1.01 PRECONSTRUCTION MEETING

A. Prior to the delivery of materials or the start of any construction, the Contractor will request a Preconstruction Meeting from the Landscape Architect. A minimum three (3) working days' notification to meeting participants will be required.

B. Schedule:

1. Landscape Architect will establish the meeting place, time and date, distribute agenda, notify participants, and administer the meeting. Contractor will notify major Subcontractors.

C. Attendance:

1. Owner
2. Landscape Architect
3. Contractor
    a. Major Subcontractors
4. Utility Companies
5. Safety Representatives
6. Governmental Agencies

D. Agenda:

1. Distribution by the Contractor and discussion, review and acceptance of:
    a. List of names and telephone numbers for superintendent, foreman and other key personnel.
    b. List of major Subcontractors and Suppliers.
    c. Projected construction preliminary progress schedules.
    d. Preliminary schedule of Shop Drawings and Sample submittals.
    e. Estimated monthly payment schedule and schedule of values
2. Critical Work sequencing.
3. Major equipment deliveries and priorities.
4. Project coordination.
5. Responsibilities of Owner, Landscape Architect, Contractor and other agencies.
6. Procedures and processing of:
    a. Field decisions.
    b. Proposal requests.

c. Submittals.

d. Change Orders.

e. Applications for Payment.

7. Adequacy of distribution of Contract Documents.
8. Procedures for maintaining Record Documents.
9. Use of premises.
10. Construction facilities, controls and construction aids.
11. Temporary utilities.
12. Safety and first aid procedures.
13. Security procedures.
14. Housekeeping procedures.
15. Testing

E. Minutes:

1. Landscape Architect will prepare and distribute copies to participants within seven (7) days of meeting. Participants will report corrections and comments within ten (10) days of receipt of minutes.

1.02 PROGRESS MEETINGS

A. Periodic Progress Meetings will be held as required by the progress of the Work.

B. Schedule:

1. Landscape Architect will establish the meeting place, time and date, distribute agenda, notify participants and administer the meeting. Contractor will notify major Subcontractors.

C. Attendance:

1. Landscape Architect
2. Contractor
3. Subcontractor as appropriate to the agenda.
4. Suppliers as appropriate to the agenda.
5. Others

D. Agenda:

1. Review minutes of previous meeting.
2. Review of work progress since previous meeting.
3. Review field observations, problems, conflicts.
4. Review problems which impede Construction Schedules.

5. Review of off-site fabrication, delivery schedules.
6. Review corrective measures and procedures to regain projected schedule.
7. Review revisions to Construction Schedules.
8. Review plan progress, schedule, during succeeding Work period.
9. Review coordination of schedules.
10. Review submittal schedules; expedite as required.
11. Review maintenance of quality standards.
12. Review proposed changes for:
    a. Effect on Construction Schedule and on completion date.
    b. Effect on other Contracts of the Project.
13. Other business.

E. Minutes:

1. Landscape Architect will prepare and distribute copies to participants and the Owner within seven (7) days of meeting for review at the next meeting.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Contractor will submit Shop Drawings, product data, and samples, as required by the individual Specification sections, to the Landscape Architect for review in accordance with the provisions of Section 00 72 00 - General Conditions.

1.02 PROGRESS SCHEDULES

A. Contractor will submit one (1) electronic copy in PDF format of Progress Schedules indicating the starting and completion dates of the various stages of the Work and estimated payments to the Landscape Architect.

1. Submit proposed Progress Schedules to the Landscape Architect prior to the Pre-Construction Meeting.

2. Distribute hard copies of the Progress Schedules to attendees during the Pre-Construction Meeting for discussion.

3. Update the Progress Schedule submit electronically (in PDF format) to the Landscape Architect as a part of applications for progress payments, through completion of the Work. Failure to update Progress Schedule may be the basis for rejection of Applications for Progress Payments.

1.03 SHOP DRAWING SCHEDULE

A. Submit one (1) electronic copy in PDF format of the Shop Drawing Schedule indicating the individual items and submission dates to the Landscape Architect.

1. Submit a preliminary Shop Drawing Schedule in accordance with the requirements in Section 00 72 00 prior to the Pre-Construction Meeting.

2. Distribute hard copies of the Shop Drawing Schedule during the Pre-Construction Meeting for discussion.

3. Submit a final electronic copy of the Shop Drawing Schedule (in PDF format) at least 10 calendar days prior to submitting the first Application for a Payment.

1.04 SCHEDULE OF VALUES

A. Submit one (1) electronic copy in PDF format Schedule of Values of the Work to the Landscape Architect.

1. Submit a preliminary Schedule of Values prior to the Pre-Construction Meeting.

2. Distribute hard copies of the Schedule of Values during the Pre-Construction Meeting or discussion.

3. Prepare a final Schedule of Values (in PDF format) in accordance with the Section 00 72 00 in sufficient detail to serve as the basis for payments during construction. Submit the Schedule of Values to the Landscape Architect for review at least 10 calendar days prior to submitting the first Application for Payment.

1.05 APPLICATIONS FOR PAYMENT

A. Submit one (1) electronic copy in PDF format Applications for Payment to the Landscape Architect in accordance with the provisions of Article 14 of Section 00 72 00.

B. Applications for Payment will be made on forms provided by or approved by the Landscape Architect.

1. Samples of the Contractor's Application for Payment, Payment Schedule and Landscape Architect's Certificate for Payment forms are included in the Contract Documents and can be obtained in digital format from the Landscape Architect.

2. Copies of these forms, with Project specific information completed by the Landscape Architect, will be given to the Contractor at the preconstruction meeting or, if applicable, after approval of the final Schedule of Values.

C. Submit a completed Payment Schedule with an executed Contractor's Application for Payment and Contractor's Declaration to the Landscape Architect not more than once per month.

D. Landscape Architect will certify payments with the use of Engineer's Certificate for Payment.

1.06 SHOP DRAWINGS

A. Shop Drawings will be presented in a clear and thorough manner. Details will be identified by reference to plan sheet number, detail number if applicable, and specification Section number, and article number.

1.07 PRODUCT DATA

A. Present Product Data in a clear and thorough manner identified the same as the Shop Drawings. Included with the information will be performance characteristics and capacities depicting dimensions and clearances required.

B. Manufacturer's standard schematic drawings and diagrams will be modified to delete information which is not applicable to the Work. Manufacturer's standard information will be supplemented to provide information specifically applicable to the Work.

1.08 SAMPLES

A. Samples will be of sufficient size and quantity to clearly illustrate functional characteristics of the product with integrally related parts and attachment devices depicting full range of color, texture and pattern.

1.09 SUBMISSION REQUIREMENTS

A. Make Submittals in accordance with the approved Submittal Schedule, and in such sequence as to cause no delay in the Work or in the work of any other contractor. No damages will be awarded, or extension of time granted, due to the Shop Drawing and product data review process.

B. Submit an entire package of Shop Drawings and Product Data information for major items of Work so that the Landscape Architect can review the package as a unit.

C. Submit one (1) electronic copy in PDF format of Shop Drawings and Product Data information containing the following information at a minimum:

1. Field dimensions clearly identified as such.
2. Relation to adjacent or critical features of the Work or materials.
3. Applicable standards, such as ASTM or Federal Specification Numbers.
4. Identification of deviations from Contract Documents.
5. Identification of revisions on resubmittals.
6. Project Title, Date of Submission, Date of Previous Submission, and Specification Section number.

D. Contractor must initial or sign Shop Drawings and Product Data submittals, certifying the Contractor's review and approval of Submittal per Section 00 72 00; verification of products, field measurements, field construction criteria, and coordination of the information within the submittal with requirements of the Work and of Contract Documents.

E. Landscape Architect will initial or sign Shop Drawings and Product Data submittal and will indicate the status of the Submittal, or requirements for resubmittal. Landscape Architect will return to the Contractor one (1) electronic copy of the Shop Drawing and/or Product Data submittal (in PDF format) for distribution or for resubmission.

1.10 LANDSCAPE ARCHITECT'S REVIEW

A. Upon receipt of any Submittal defined above, the Landscape Architect will:

1. Check each for completeness, clarity, correctness, cohesiveness, legibility, and reproducibility.
2. Review each only for general conformity with the Contract Documents as specified in Section 00 72 00.
3. Respond to the submittal within 15 calendar days of receipt from Contractor.
    a. Contractor to allow for increased time for large or complex submittals; up to 30 calendar days may be required for major equipment and materials or Submittals which require review by more than one engineering discipline.

B. After review of any Submittal, the Landscape Architect will appropriately affix a stamp, electronic notation box or other means, signifying the Submittal as having received full consideration and review.

C. The "status" of any such Submittal or portion thereof, as appropriate, will be evidenced by any one or more of the following notations clearly signified by a "X" or other similar mark placed in the box adjacent to the notation:

1. Notations for Landscape Architect's Review:
    a. Approved
    b. Approved as Noted
    c. Revise and Resubmit
    d. Rejected - See Remarks

e. For Record Only

2. Notations for Response Required by Contractor:

a. None

b. Confirm

c. Resubmit

D. Notation Meanings:

1. Elements marked "Approved" indicate that the Contractor may commence with construction, fabrication or purchase of such items.

2. Elements marked "Approved as Noted" may require further action by the Contractor before commencing with construction, fabrication or purchase:

a. Contractor proceeds in strict accordance with the Landscape Architect's notes and/or required corrections/deletions/additions indicated thereon;

b. Contractor provides an appropriate response as may be noted by the Landscape Architect.

3. Elements marked "Revise and Resubmit" indicate that further comments or explanations have been affixed to the Submittal, which may require action(s) by the Contractor before Landscape Architect will mark the Submittal "Approved" or "Approved as Noted."

4. Elements marked "Rejected - See Remarks" indicate that the Contractor must make the required corrections as shown or noted and resubmit such items to the Landscape Architect for further review.

5. Elements marked "For Record Only" indicate that the Landscape Architect has not reviewed the Submittal and will maintain the information submitted as part of the project record.

6. Elements marked "None" indicate that the Submittal requires no further action by the Contractor.

7. Elements marked "Confirm" requires the Contractor to provide affirmation to the Landscape Architect regarding comments, notes, markings, etc. made by the Landscape Architect, and to affirm that the Contractor will comply with the comments, notes, markings, etc.

8. Elements marked "Resubmit" indicate that the Contractor may not commence with construction, fabrication or purchase of such items, and that the Contractor must resubmit items for review that comply with the Contract Documents in the event that those originally submitted do not, or with any comments, notes, markings, etc. made by the Landscape Architect.

1.11 RESUBMISSION REQUIREMENTS

A. Contractor will make corrections or changes in the Submittals required by Landscape Architect and resubmit. Contractor will indicate any changes which have been made other than those requested by the Landscape Architect.

1.12 MANUFACTURER'S OPERATION AND MAINTENANCE DATA

A. Submit one (1) electronic copy in PDF format and one (1) bound copy of all operation and maintenance data required per the various Specification sections.

1. Prior to 50% completion of the Project, Contractor will have submitted one (1) acceptable copy to the Landscape Architect for review.

B. Final copies of the operation and maintenance data will be bound in a suitable number of 3-inch or 4-inch, 3-ring hard cover binders. Permanently imprinted on the cover will be the words "Manufacturer's Operation and Maintenance Data", Project title, location of the Project, and the date. A table of contents will be provided in the front of each binder to list the various sections in the manual.

C. The information to be provided in each section of the manual, for each piece of equipment and project component will include, but not be limited to, detailed equipment drawings; sections cut through all of the major equipment and sub-assemblies; installation and operational procedures; complete wiring and piping schematics; lubrication materials and procedures; maintenance procedures; and parts lists complete enough to permit identification of parts by nomenclature, manufacturer’s part number and use.

D. At the front of each section a maintenance schedule will be provided for each piece of equipment in the section.

1. The schedule will display the daily, weekly, monthly, semi-annual, annual or fraction thereof, lubrication and preventative maintenance required in order to meet warranty conditions and the manufacturer's recommendations for optimum performance and life of the unit.

2. A common schedule format is to be developed and used for all of the sections. Photocopies or reproductions of the manufacturer's literature will not be accepted.

1.13 AUDIO/VIDEO ROUTE SURVEY

A. When required in Section 00 42 43 - Proposal or Section 01 11 00 - Summary of Work, furnish the Landscape Architect with an "Audio/Video Route Survey" record of the existing conditions prior to the start of construction. Contractor must enlist the services of a firm having a minimum of one (1) year experience in audio/video recording of construction projects.

B. Prior to beginning the audio/video recording, review with Landscape Architect the Project requirements to ensure that the audio/video is adequate for its intended purpose. Owner will have the authority to designate areas for which coverage may be added or omitted. The audio/video recording will be done prior to placement of materials or equipment on the construction area and furnished one (1) week prior to the pre-construction meeting.

C. Format:

1. Audio/Video route survey will be submitted in the format(s) as specified in Section 01 11 00.

a. Audio/video route survey submission will be on USB media

b. Format: USB – Video

c. Video Encoding: Highest available bit rate (6-9 Megabit), 60 fields per second interlaced video

d. Audio Encoding: Uncompressed stereo wave or stereo Dolby Digital (256 kilobit or better)

e. Aspect Ratio: 4x3 (720x480 pixels)

f. No Macrovision or other copy protection encoding. No region code or region code 1.

D. Complete coverage will include surface features located within the public right-of-way, easement areas and adjacent private properties up to building line when such properties lie within the zone of influence of construction and will be supported by appropriate audio description made simultaneously with video coverage. Such coverage will include, but not be limited to, existing driveways, sidewalks, curbs, ditches, roadways, landscaping, trees, culvert, headwalls, retaining walls, and buildings located within such zone of influence. Video coverage will be clear enough to identify cracks, depressions, holes and other defects in existing surfaces.

E. Houses and buildings will be identified visually by house number, when visible, in such a manner that structures of the proposed system can be located by reference. In all instances, however, location will be identified by audio or visual means at intervals not-to-exceed 100 linear feet (30 m) in the general direction of travel.

F. When conventional wheeled vehicles are used, the distance from the camera lens to the ground will be not less than 12 feet (3.5 m) to ensure proper perspective. The rate of speed in the general direction of travel of the conveyance used during recording will not exceed 30 feet/minute (10 m/min). Panning rates and zoom-in, zoom-out rates will be controlled sufficiently such that stop action during play-back will produce clarity of detail of the object viewed.

G. Video recordings must, by electronic means, display continuously and simultaneously generated transparent digital information in the upper left hand third of the screen to include the date and time of recording, as well as the corresponding engineering stationing numbers as shown on the Contract Drawings.

1. The date information will contain the month, day, and year. For example, mm/dd/yy, and be placed directly below the time information.

2. The time information will consist of hours, minutes, and seconds, separated by colons. For example, hh:mm:ss.

H. Engineering stationing numbers must be continuous, accurate and correspond to the Project stationing and must include the standard engineering symbols. For example, Station 14+84.

I. Recording will be done during times of good visibility. No recording will be done during periods of visible precipitation, or when more than ten (10) percent of the ground area is covered with snow or standing water, unless otherwise authorized by the Owner.

J. In some instances, audio/video coverage may not be suitable for recording necessary details. In such instances, the Owner may specify still photographs to provide coverage. One (1) color photograph will be provided in accordance with this Section with a suitable description of the photograph’s location.

K. Any portion of the Audio/Video Route Survey of insufficient quality as determined by the Landscape Architect will be redone by the Contractor at no additional cost to the Owner.

L. Each USB will be properly identified with the Project Title, location, time, and date in a manner acceptable to the Owner.

1.14 PHOTOGRAPHS

A. When required in Section 00 42 43 - Proposal or Section 01 11 00 - Summary of Work, furnish the Landscape Architect with a total of 6 to 10 digital color photographs each month during construction of the Project, unless some other number and times is specified in Section 01 11 00 - Summary of Work.

B. Photos will be in digital format (i.e., JPEG, TIFF, GIF, PNG or PDF) and will have a minimum resolution of 300 dpi.

C. The following information will be placed on the photo itself or embedded in the digital file:

1. Project Title
2. Contract Number
3. Description of photo’s content
4. Date and Time of photo

D. Submit photographs monthly along with the Application for Payment as described in Article 14 of Section 00 72 00.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 45 00 - QUALITY CONTROL

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Sampling of materials will be made by the Landscape Architect in accordance with the methods designated by the Specifications. Contractor will furnish such facilities as the Landscape Architect may require for collecting, storing, and forwarding samples to the Laboratory. Contractor will furnish the required samples to the Owner without charge.

1.02 TESTS OF MATERIALS

A. Materials in the Work will meet the requirements of the Contract Documents.

B. Tests of materials will be made as specified herein. Landscape Architect will at all times have access to materials intended for use in the Work as well as to the plants where such materials are produced. Plant inspection may be made if the quantities are sufficient to warrant such inspection and if it is to the best interest of the Owner. In any case materials may be either inspected or tested when received on the Project.

C. Materials will not be used until approval has been received from the Landscape Architect. Approval of materials at the producing plant does not constitute a waiver of the Landscape Architect's right for re-examination at the Project site.

D. The standards for testing materials unless otherwise specified, will be as established by the American Society for Testing and Materials (ASTM). Tests of materials will be made in accordance with the methods described or designated in the Specifications.

E. The sampling and testing of all materials not specifically mentioned will be done by generally accepted methods, unless otherwise specified by the Landscape Architect.

1.03 CERTIFICATION OF MATERIALS

A. At the request of the Landscape Architect, the Contractor will provide the Landscape Architect with certification that the various materials to be used conform to the standards referred to in the Contract Documents.

1.04 SOURCE QUALITY CONTROL

A. Testing identified in the Contract Documents for quality control, which is required to establish quality of materials, equipment or fabricated items, will be paid for by the Contractor unless otherwise noted.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SITE ACCESS AND PARKING

A. Contractor will locate roads, drives, walks and parking facilities to provide uninterrupted access to construction offices, mobilization, Work, storage areas, and other areas required for execution of the Contract. Access drives and parking areas will be hard surfaced unless otherwise approved by the Landscape Architect.

B. Contractor will maintain driveways a minimum of 15 feet (5 meters) wide between and around combustible materials in storage and mobilization areas.

C. Contractor will maintain traffic areas as free as possible of excavated materials, construction equipment, products, snow, ice, and debris.

D. Contractor will not utilize existing parking facilities for construction personnel or for Contractor's vehicles or equipment, unless written permission from owner of parking facility is obtained.

1.02 TRUCKING ROUTE AND PUBLIC ROAD MAINTENANCE

A. Prior to the start of construction, the Contractor will submit for review a schedule and list indicating the streets and roads within the municipality that Contractor's equipment will use off the Project site.

B. Contractor will comply with safety requirements, weight restrictions and speed limits.

C. Gravel and dirt roads or streets used will be maintained by grading, placing dust palliatives and maintenance gravel in sufficient quantities to eliminate dust and maintain traffic.

D. Paved streets will be maintained in a reasonable state of cleanliness and the Contractor will remove accumulations of debris, dirt or mud caused by Contractor's operations. Removal will be done in such a manner as to prevent the release of dust. This will be done at least every day at the close of each day's operation or additionally when requested by the Landscape Architect.

E. Roads or streets damaged by the Contractor’s operations, will be repaired or removed and replaced to satisfactions of the agency having jurisdiction at no additional cost to the Project.

F. In order to ensure adequate street maintenance and restoration as outlined above, the Contractor may be required to deposit with the agency having jurisdictiona cash Road Protection Bond. This Bond, if required, will be held in escrow until final release is given by the agency having jurisdiction.

1. In the event the Contractor fails or neglects to maintain or restore the streets to the satisfaction of the agency having jurisdiction, the agency having jurisdiction will have the required maintenance or restoration work done and the cost incurred will be deducted from the Road Protection Bond.

2. At the completion of the Project, the agency having jurisdiction will return the Road Protection Bond less any monies expended by the agency having jurisdiction and will render to the Contractor an accounting of all monies so expended.

G. Contractor will not store any equipment, supplies, construction material or excess excavated material on any roads or streets unless otherwise approved by the Landscape Architect.

1.03 EMERGENCY ACCESS

A. Contractor will at all times provide emergency access to property in the vicinity of the construction for police vehicles, fire equipment, ambulances or other emergency vehicles to protect life, health and property. Areas damaged by emergency vehicles will be restored by the Contractor at no additional cost to the Owner.

1.04 PRIVATE OR PUBLIC ROADS, SIDEWALKS, AND PARKING AREAS

A. Where public roads, driveways, parking areas and sidewalks are encountered throughout the community, the Contractor will maintain those portions affected by the construction operations in a passable condition until such time as final restoration of these improvements can be made as specified.

1. If, in the opinion of the Landscape Architect, the public safety is in danger or the necessity exists for maintaining traffic, the Landscape Architect may direct that backfilling be completed immediately.

2. In the event that the necessary backfill material and equipment are not available when direction is given for immediate backfill, the trench will be backfilled with native material to provide for the necessary maintenance of traffic and safety; however, the native material will be removed within 48 hours and the trench properly backfilled as specified.

B. Contractor will provide written notice to residences and businesses of driveway access interruption 72 hours in advance of interruptions.

1. Written notices require approval for distribution from the Landscape Architect.

2. Contractor will provide the Landscape Architect with copies of notices at least five (5) working days in advance of their distribution for review and approval.

C. Where private roads are encountered throughout the community, the Contractor will maintain those portions affected by its construction operations in a passable condition. These roads will be maintained by the use of 21A road maintenance gravel, stone or slag.

1. In the event the original subbase has been destroyed, the Contractor will furnish and install1-inch to 2-inch aggregate to stabilize the existing subbase.

D. Upon completion of the construction activities, the Contractor will shape and regrade these roads leaving them in a condition as good as or better then original, and adequate for normal travel.

1.05 WORK WITHIN RAILROAD COMPANY RIGHT-OF-WAY

A. Contractor will be responsible for complying with the requirements of the Railroad Company for all Work of the Project and/or temporary crossings for trucking routes. Unless otherwise provided by an item of these Specifications, the Contractor will bear costs and expenses incidental thereto, including, but not limited to, protection, flagmen, construction engineering inspection by the railroad, and incidental work such as drainage facilities and removal, alteration and replacement of railroad fences.

1.06 ROAD CLOSING

A. No street, road or section thereof will be closed to through traffic unless otherwise provided for on the Plans, Specifications, or authorized by the agency with jurisdiction over the roads. Prior to closing a street, road, or section thereof, the Contractor will provide the Landscape Architect with a copy of a detour plan approved by the agency having jurisdiction over the roads.

B. In the event roads or streets are to be closed, the Contractor will notify the local fire department, police department, local road authority, ambulance and emergency services, Department of Public Works, public transit authority and public school system daily as to what streets will be partly blocked or closed, the length of time the streets will be blocked or closed and when the streets will be reopened to traffic. Contractor will designate one responsible employee to carry out the requirements of this condition.

C. During the time that the road is closed, the Contractor will make provision for trash, leaf, and rubbish (garbage) pickup.

1.07 MAINTAINING TRAFFIC

A. Contractor will provide access for local traffic to property along the Project by means of temporary roads, drives, culverts or other means approved by the Landscape Architect. Contractor will grade, add surfacing materials, and dust palliatives to such temporary roads and drives as necessary for the proper maintenance of traffic.

B. Where the shoulder is used to maintain traffic, the shoulder will be graded, surfaced, treated for dust, constructed, or reconstructed, as specified herein or as shown on the Plans.

C. If the construction work is suspended due to weather conditions, winter shut down or for any other reason, sufficient labor, materials and equipment will be ready for immediate use at all times for the proper maintenance of traffic. Surfacing materials and dust palliatives will be applied at such times and locations and in such amounts as necessary to safely maintain traffic and as determined by the Landscape Architect.

D. Where shoulders are low, high, soft or rough, adequate provisions will be taken to inform and protect the traveling public by means such as construction warning signs, barricades, lighted devices, etc. Such shoulder hazards will be eliminated as soon as practicable.

E. Contractor will furnish, erect and maintain all signs, barricades, lights, and traffic regulators, in accordance with the requirements of the current "Michigan Manual of Uniform Traffic Control Devices".

1. Furnish all flagmen and watchmen as are necessary to maintain and safeguard traffic along the entire Project. Failure to comply with these requirements may be cause for the Owner to issue a stop Work order, which will remain in effect until all necessary devices are in place and operational. The issuance of a stop Work order will not be reason for granting additional compensation or an extension to the Contract Time.

2. Furnishing, installing, and maintaining traffic control devices will be incidental to the Project unless otherwise provided for in the Proposal.

1.08 EXISTING SIGNS

A. No stop sign, traffic control or warning device or sign will be taken down until the agency having jurisdiction over the roads has been notified and arrangements for the immediate

reinstallation has been made. Contractor will provide temporary signs, traffic control devices, warning devices, or watchmen continuously from the time the item is removed until it is reinstalled. Signs removed will be replaced with signs meeting requirements of the agency having jurisdiction over the roads.

1.09 TEMPORARY ELECTRICITY AND LIGHTING

A. Contractor will be responsible for and pay all costs for the installation and removal of circuit and branch wiring, with area distribution boxes located so that power and lighting is available throughout the construction by the use of construction-type power cords and will pay all costs of electrical power used.

B. Electrical wiring and distribution will conform to the National Electrical Code as adopted by the State of Michigan.

1.10 TELEPHONE

A. Contractor is required by MIOSHA regulations to provide telephone service for contacting emergency services. Such emergency telephone service will also be available for the use of the Owner and Landscape Architect whether or not a field office is required for the Project. Emergency phone numbers are required to be posted per MIOSHA regulations

B. Contractor will pay all costs for installation, maintenance and removal, and service charges for local calls to provide service for Contractor's construction site office as well as for the Landscape Architect's field office. Toll charges for calls relating to Project business will be at the Contractor's expense.

1.11 USE OF WATER

A. Contractor will acquire permits, post bonds and pay fees required by the local agency having jurisdiction prior to using any hydrant or any other source of water.

B. Contractor will reimburse the local community for all water consumed during course of the Project at the current rate as set by the agency having jurisdiction.

1.12 SANITARY PROVISIONS

A. Contractor will be responsible for installation, maintenance and removal of temporary sanitary facilities per MIOSHA regulations for use of construction personnel including the Owner and Landscape Architect. Rules and regulations of the State and local health officials will be observed, with precautions taken to avoid creating unsanitary conditions.

1.13 POTABLE WATER

A. Contractor will furnish a supply of potable water per MIOSHA requirements, available for use of construction personnel including the Owner and Landscape Architect.

1.14 MEDICAL SERVICES AND FIRST AID

A. Contractor will furnish first aid supplies and a person trained in first aid with a valid first aid certificate, per MIOSHA requirements, available for use of construction personnel including the Owner and Landscape Architect. Contractor will also furnish a communication system for contacting emergency services. The telephone numbers of the physician, hospital, or emergency services will be conspicuously posted at the job site.

1.15 POSTAL SERVICE

A. Residents in this Project area may receive their mail at roadside mailboxes. Since the postal service will not deliver mail to a resident without a mailbox or a mailbox that is not in its proper position, the Contractor will relocate, replace and repair all mailboxes and posts in a condition and height acceptable to the post office within 24 hours of the removal.

B. If required, the Contractor will furnish new posts for the mailboxes if the existing posts are broken or rotted to the extent that they cannot be reused.

C. Any mailbox damaged by the Contractor's operations or by anyone else while the box is down due to the Contractor's operation, will be replaced by the Contractor with a new mailbox meeting the postal officials' specifications and the resident's name and address neatly lettered with paint or other acceptable means to the satisfaction of the resident and postal authorities.

D. The cost for relocating mailboxes will be incidental to the Project unless otherwise specified in Section 00 42 43 - Proposal.

1.16 NEWSPAPER DELIVERY

A. Residents in this Project area may receive their newspapers at roadside tubes. Since the resident arranges for newspaper delivery, the Contractor will notify the resident 24 hours prior to removal of any newspaper tube.

B. Newspaper tubes damaged by the Contractor while carrying out Contractor's operations or by anyone else while the tube is down due to the Contractor's operation, will be replaced as agreed between the Contractor and the newspaper who owns the damaged tube. The cost will be incidental to the Project.

1.17 BUS STOPS AND SHELTERS

A. Prior to the start of any construction, the Contractor will notify the transit authority that has bus stops within the area of the Work. Removal, relocation and/or replacement of signs and/or benches will be the responsibility of the Contractor in accordance with any requirements of the transit authority. The cost will be incidental to the Project.

1.18 ENGINEER'S FIELD OFFICE

A. When called for in the Summary of Work, Section 01 11 00 - Summary of Work, the Contractor will furnish and maintain, for the exclusive use of the Landscape Architect, an approved weatherproof building as a field office. The building will be located as directed by the Landscape Architect, in full view of the Work and with at least one (1) window facing construction operations.

B. Landscape Architect’s field office will meet the following minimum requirements:

1. securely fixed to foundation
2. structurally sound and watertight
3. stairs and landings for doors as necessary
4. three hundred (300) square feet (28 m2)
5. three operable and locking windows with screens and storms.

6. two locking, standard sized, entrance/exit doors
7. two telephone lines
8. two telephone jacks for each line
9. one telephone
10. one facsimile machine
11. 120 volt electrical service per NEC, complete
12. one 36" x 42" (1m x 1.1m) drafting table
13. one drafting stool
14. one 30" x 60" (.75m x 1.5m) desk
15. one four drawer locking file cabinet
16. two desk chairs
17. one plan rack (minimum capacity eight plan sets)
18. one first aid kit
19. one 10A:80-B:C fire extinguisher
20. automatically controlled heating, ventilating, air conditioning system to maintain temperature between 68 and 76 degrees Fahrenheit, year round.

C. Contractor will furnish and maintain bottled water and sanitary facilities for the field office. Contractor will clean the office at least once per week. Contractor will provide and pay for all utility service throughout the duration of the Project, including telephone service and long distance telephone service.

D. A trailer having equal facilities and floor space may be used in place of the above described field office if so desired.

E. The field office will be furnished with a minimum of an aggregate surfaced driveway and parking area, for the exclusive use of the Landscape Architect, for at least three (3) vehicles. Contractor will maintain parking area including snow removal.

F. The cost for furnishing and installing the field office, for furnishing utilities and utility service, and for maintenance of the field office and facilities, unless otherwise specified in the Proposal, will not be paid for separately but will be included in the price bid for various items of Work under the Contract. The building will be removed by the Contractor upon completion of the Contract and will become Contractor's property.

1.19 BY-PASS PUMPING

A. Contractor will maintain flow in existing sanitary and storm sewers by pumping, bypassing, or fluming, as necessary. During wet weather events, the flow in the sewer will rise rapidly and may become surcharged. Contractor will maintain flow in such a manner as the existing flow can be adequately transported including wet weather flow. Contractor will furnish, install,

operate, and maintain temporary pumping facilities to service the upstream area including piping, temporary channels, pumps, sumps, controls, temporary plugs, and bulkheads.

B. For sanitary sewerage, by-pass piping will be PVC Schedule 80, ABS truss pipe, equivalent with solvent welded joints, HDPE with butt fused joints, or _____. Flexible hoses of whatever types are not acceptable. Bypassed flow will be discharged to a sanitary sewer of acceptable size to handle the bypassed and existing flows. Contractor will plan construction operations such that there will be no backups, leaks, or discharges of pollutants.

C. Contractor will furnish and have available on-site, redundant pumping facilities in case of any failure of the pumping system including pumps, piping, electrical, connections, etc. Redundant pumping facilities also include having a backup power generator in case the primary power source fails. Contractor will provide an adequate labor force to oversee the by-pass pumping including providing labor to maintain 24 hour per day operation and emergency backup service.

D. Costs for pumping and by-passing flow will be included in the unit price bid for other items of Work unless otherwise specified in the Proposal.

E. Contractor will submit a by-pass pumping/diversion scheme to the Landscape Architect for approval not less than 15 calendar days prior to any anticipated by-pass pumping/diversion. The by-pass pumping plan will include pumping capacity and expected flow rates.

PART 2 PRODUCTS

2.01 BARRICADES, ARROW BOARDS, TEMPORARY PAVEMENT MARKINGS, AND TEMPORARY SIGNS

A. Barricades, arrow boards, temporary pavement markings, temporary signs, and other traffic control devices will be in accordance with the current edition of the MDOT Standard Specifications for Construction, and the current edition of the "Michigan Manual of Uniform Traffic Control Devices".

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 56 39
TREE AND PLANT PROTECTION

PART 1 GENERAL

1.1 SUMMARY

A. The scope of work includes labor, materials, tools, equipment, facilities, transportation and services necessary for, and incidental to performing all operations in connection with protection of existing trees and other plants as shown on the drawings and as specified herein. Work also includes Contractor:

1. Provide preconstruction evaluations.
2. Provide tree and plant protection fencing.
3. Provide protection of root zones and above ground tree and plants.
4. Provide pruning of existing trees and plants.
5. Coordinate with the requirements of Section Planting Soil for modifications to the soil within the root zone of existing trees and plants.
6. Provide insect and disease control.
7. Provide maintenance of existing trees and plants including irrigation during the construction period as recommended by the arborist report.
8. Provide maintenance of existing trees and plants including irrigation during the post construction plant maintenance period.
9. Remove tree protection fencing and other protection from around and under trees and plants at the conclusion of construction activities.
10. Clean up and disposal of excess and surplus materials.

1.2 RELATED DOCUMENTS AND REFERENCES

A. Related Documents:

1. Drawings and general provisions of contract including general and supplementary conditions and Division 01 specifications apply to work of this section.
2. Section 32 90 00 - Plantings
3. Section 32 92 19 - Seeding
4. Section 32 92 23 - Sodding

B. References:

1. The following specifications and standards of the organizations and documents listed in this paragraph form a part of the Section to the extent required by the references thereto. In the event that the requirements of the following referenced standards and specifications conflict with this Section, the requirements of this Section will prevail. In the event that the requirements of any of the following referenced standards and specifications conflict with each other the more stringent requirement will prevail.

a. ANSI A300 Part 5 - Standard Practices for Tree, Shrub and other Woody Plant Maintenance, most current editions.

b. Pruning practices will conform with recommendations “Structural Pruning: A Guide for the Green Industry”; Published by Urban Tree Foundation, Visalia, California; most current edition.

c. Mitigation cost calculation will follow specified methods in the “Guide for Plant Appraisal” 10th Edition (Revised 2020); Authored by representatives of the Council of Tree and Landscape Appraisers®; Published by the International Society of Arboriculture.

d. Glossary of Arboricultural Terms, International Society of Arboriculture, Champaign Il, most current edition.

1.3 VERIFICATION

A. Scaled dimensions on the Drawings are approximate. Before proceeding with any work, Contractor will carefully check and verify dimensions and quantities, and will immediately inform Landscape Architect of discrepancies between the information on the Drawings and the actual conditions, refraining from doing any work in said areas until given approval to do so by Landscape Architect.

1.4 PERMITS AND REGULATIONS

A. Contractor to obtain and pay for permits related to this Section of the work unless previously excluded under provision of the Contract or General Conditions. Contractor will comply with laws and ordinances bearing on the operation or conduct of the work as drawn and specified. If Contractortobserves that a conflict exists between permit requirements and the work outlined in the Contract Documents, Contractor must promptly notify Landscape Architect 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 will 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 will apply or Landscape Architect will determine which will govern.

1.5 PROTECTION OF WORK, PROPERTY AND PERSON

A. Contractor will protect the work, adjacent property, and the public, and will be responsible for any damages or injury due to their actions.

1.6 CHANGES IN THE WORK

A. Landscape Architect may order changes in the work, and the contract sum should be adjusted accordingly. Such orders and adjustments plus claims by Contractortfor extra compensation must be made and approved in writing before executing the work involved.

1.7 CORRECTION OF WORK

A. Contractor will re-execute any work that fails to conform to the requirements of the Contract and will remedy defects due to faulty materials or workmanship upon written notice from Landscape Architect, at the soonest possible time that can be coordinated with other work and seasonal weather demands.

1.8 DEFINITIONS

A. Terms in this Section will be as defined in the “Glossary of Arboricultural Terms” or as modified below.

1. Landscape Architect: Appointed by Owner to represent their interest in the review and approval of the work and to serve as the contracting authority with Contractor. Landscape Architect may appoint other persons to review and approve any aspects of the work.

2. Reasonable and Reasonably: When used in this Section is intended to mean that the conditions cited will not affect the establishment or long term stability, health or growth of the plant. This Section recognizes that plants are not free of defects, and that plant conditions change with time. This Section also recognizes that some decisions cannot be totally based on measured findings and that profession judgment is required. In cases of differing opinion, the Landscape Architect's expert will determine when conditions within the plant are judged as reasonable.

3. Shrub: Woody plants with mature height approximately less than 25 feet.

4. Tree and Plant Protection Area: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and defined by a circle centered on the trunk with each tree with a radius equal to the clown dripline unless otherwise indicated by Landscape Architect.

5. Tree: Single and multi-stemmed plants, including palms with anticipated mature height approximately greater than 25 feet or any plant identified on the plans as a tree.

1.9 SUBMITTALS

A. Arborist Report: Prior to the start of construction, submit, for approval by Landscape Architect, the report of a consulting arborist who is a registered Consulting Arborist® (RCA) with American Society of Consulting Arborists or an ISA Certified Arborist, which details the following information for trees to remain within the area designated on the Drawings as the "Tree and Plant Protection Area." The report will include the following:

1. A description of each tree to remain indicating its genus and species, condition including any visible damage to the root system or soil within the root zone, tree diameter at breast height (dbh) and approximate height, size and any visible disease, insect infestations and or branch and trunk structural deficiencies.

2. The report will note all trees or parts of trees, which are considered a hazard or significant or extreme risk level. Include the International Society of Arboriculture hazard evaluation sheet for each tree, which may reasonably be identified as a potential hazard tree.

3. Recommendations as to treatment of insect, disease and structural problems encountered.
4. Recommendations for fertilizer treatments, if any.
5. A site plan of the site showing the location of all trees included in the report.

B. Product Data:

1. Submit manufacturer product data and literature describing all products required by this section to the Owner's Representative for approval. Provide submittal four weeks before the start of any work at the site.

C. Qualifications: For each applicable person expected to work on the project, provide copies of the qualifications and experience of the Consulting arborist, proof of either the registered Consulting Arborist® (RCA) with American Society of Consulting Arborists or an ISA Certified Arborist and any required Herbicide/Pesticide license to the Owner's Representative, for review prior to the start of work.

1.10 OBSERVATION OF THE WORK

A. Landscape Architect may inspect the work at any time.

1.11 PRE-CONSTRUCTION MEETING

A. Schedule a Pre-Construction Meeting with Landscape Architect at least seven (7) days before beginning work to review any questions Contractor may have regarding the work, administrative procedures during construction and project work schedule.

1. The following are to attend the preconstruction conference:

a. Contractor.
b. Consulting Arborist.
c. Subcontractor assigned to install tree and plant protection measures.
d. Earthwork subcontractor.
e. Site utility subcontractors that may be required to dig or trench into the soil.
f. Landscape subcontractor.
g. Irrigation subcontractor.

B. Prior to this meeting, Contractorwill mark trees and plants to remain and or be removed as described in this specification for review and approval by Landscape Architect.

1.12 QUALITY ASSURANCE

A. Pruning, branch tie back, tree removal, root pruning, and fertilizing required by this Section will be performed by or under the direct supervision of ISA Certified Arborist. Contractorwill submit aforementioned individual's qualifications for approval by Landscape Architect.

B. Applications of pesticide or herbicide wil be performed by a person maintaining a current state license to apply chemical pesticides valid in the jurisdiction of the project.

Contractorwill submit copies of required state licensing certificates including applicable chemical applicator licenses for approval by Landscape Architect.

PART 2 PRODUCTS

2.1 MULCH

A. Mulch will be coarse, ground, from tree and woody brush sources. The minimum range of fine particles will be 3/8 inchor less in size and a maximum size of individual pieces will be approximately 1 to 1-1/2 inchesin diameter and maximum length of approximately 4 to 8 inches inches. No more that 25% of the total volume will be fine particles and no more than 20% of total volume be large pieces.

1. It is understood that mulch quality will vary significantly from supplier to supplier and region to region. The above requirements may be modified to conform to the source material from locally reliable suppliers as approved by Landscape Architect.
2. Cypress mulch is not allowed.

B. Submit product data that product meets the requirements and 2-gallon sample for approval by Landscape Architect.

2.2 WOOD CHIPS

A. Wood chips will be from an arborist chipping operation with less than 20% by volume green leaves. Chips stockpiled from the tree removal process may be used.

2.3 TREE PROTECTION FENCING

A. Plastic Mesh Fence:

1. Heavy-duty orange plastic mesh fencing fabric 48 incheswide. Fencing will be attached to metal “U” or “T” post driven into the ground of sufficient depth to hold the fabric solidly in place with out sagging. The fabric will be attached to the post using attachment ties of sufficient number and strength to hold up the fabric without sagging. Landscape Architectmay request, at any time, additional post, deeper post depths and or additional fabric attachments if the fabric begins to sag, lean or otherwise not present a sufficient barrier to access.

B. Chain Link Fence:

1. 6 feet tall metal chain link fence set in metal frame panels on movable core drilled concrete blocks of sufficient size to hold the fence erect in areas of existing paving to remain.

C. Gates:

1. In each separate fenced area, provide a 3-foot-wide gate. The location of the gates will be approved by Landscape Architect.

D. Submit suppliers product data that product meets the requirements for approval.

2.4 TREE PROTECTION SIGN

A. Heavy-duty weather resistant signs a minimum of 8.5 inches x 11 inches, white colored background with black 2 inch high or larger letters block letters. Signs will be attached

to the tree protection fence every 50 feet on center. The tree protection signs will read "Tree and Plant Protection Area- Keep Out".

2.5 TREE GROWTH REGULATOR (TGR)

A. Cambistat 25C.

B. Submit suppliers product data that product meets the requirements for approval.

2.6 MATTING

A. Matting for vehicle and work protection will be heavy duty matting designed for vehicle loading over tree roots.

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

B. Submit suppliers product data that product meets the requirements for approval.

2.7 GEOGRID

A. Geogrid will be woven polyester fabric with PVC coating, Uni-axial or biaxial geogrid, inert to biological degradation, resistant to naturally occurring chemicals, alkalis, acids.

1. Geogrid will be Miragrid 2XT as manufactured by Ten Cate Nicolon, Norcross, GA, or approved equal.

B. Submit suppliers product data that product meets the requirements for approval.

2.8 FILTER FABRIC

A. Filter fabric wil be nonwoven polypropylene fibers, inert to biological degradation and resistant of naturally occurring chemicals, alkalis and acids.

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

B. Submit suppliers product data that product meets the requirements for approval.

PART 3 EXECUTION

3.1 SITE EXAMINATION

A. Examine the site, tree, plant and soil conditions. Notify Landscape Architect in writing of any conditions that may impact the successful tree and plant protections that is the intent of this Section.

3.2 COORDINATION WITH PROJECT WORK

A. Contractorwill coordinate with all other work that may impact the completion of the Work covered by this Section.

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

C. Coordinate the relocation of any irrigation lines currently present on the irrigation plan, heads or the conduits of other utility lines or structures that are in conflict with tree locations. Root balls will not be altered to fit around lines. Notify Landscape Architect of any conflicts encountered.

D. Tree and Plant Protction Area:

1. 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 will be the drip line (i.e., outer edge of the branch crown) of each tree.

3.3 PREPARATION

A. Prior to the preconstruction meeting, layout the limits of the "Tree and Plant Protection Area" and then alignments of required tree and plant protection fencing and root pruning. Contractor will obtain the Landscape Architect's approval of the limits of the protection area and the alignment of fencing and root pruning.

B. Contractor will flag trees and shrubs to be removed by wrapping orange plastic ribbon around the trunk and obtain Landscape Architect's approval of trees and shrubs to be removed prior to the start of tree and shrub removal. After approval, mark trees and shrubs to be removed with orange paint in a band completely around the base of the tree or shrub 4.5 feet above the ground.

C. Contractor will flag trees and shrubs to remain with white plastic ribbon tied completely around the trunk or each tree and on a prominent branch for each shrub. Obtain Landscape Architect's approval of trees and shrubs to be remain prior to the start of tree and shrub removal.

D. Prior to any construction activity at the site including utility work, grading, storage of materials, or installation of temporary construction facilities, Contractorwill install tree protection fencing, filter fabric, silt fence, tree protection signs, geogrid, mulch and or wood chips as shown on the Drawings.

3.4 SOIL MOISTURE

A. Volumetric soil moisture level, in all soils within the "Tree and Plant Protection Area" will be maintained above permanent wilt point to a depth of at least 8 inches. No soil work or other activity will 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 will 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%

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

C. Contractorwill confirm the soil moisture levels with a moisture meter. If the moisture is too high, Contractorwill suspend operations until the soil moisture drains to below field capacity.

3.5 ROOT PRUNING

A. Prior to any excavating into the existing soil grade within 25 feet of the limit of the "Tree and Plant Protection Area" or trees to remain, root prune all existing trees to a depth of 24 inches below existing grade in alignments following the edges of the "Tree and Plant Protection Area" or as directed in writing by Landscape Architect. Root pruning will be in conformance with ANSI A300 (Part 8) latest edition.

1. Root pruning will be done with a sharp tool, in such a way that does not pull on the roots but leaves smooth cuts.
2. Pruning will be made to a 24-inch depth within 2 feet of the limit of grading.
3. Root pruning methods are described below. If no method is called out in the specifications, general conditions or the drawing package, root pruning will be performed using the Air Excavation Method.
    a. Air Excavation Method:
        1) Using Air Excavation Tools such as an Air Knife or AirSpade®, excavate the trench to 24-inches below existing grade with a width suitable for inspecting and pruning the roots using the approved cutting tools.
        2) Using handsaws, lopping shears; chisels, hand shears, chain saws, circular saws, and/or reciprocating saws with sharp pruning blade; cleanly cut and remove the portions of roots within the trench.
    b. Root Pruning Device Method:
        1) Using a root pruner such as a Dosko®, Vermeer® or blade styled root pruner, make clean and deliberate cuts to a depth of 24-inches below existing grade.
    c. Alternative Device Method:
        1) Using an alternative pruning device such as a rock saw, chain trencher or similar trenching device, perform slow and deliberate cuts to a depth of 24-inches below existing grade.
        2) After completion of the cut, make clean cuts with a handsaw, lopping shear; chisels, hand shears, chain saws, circular saws, and/or reciprocating saws with sharp pruning blade; to remove all torn root ends on the tree side of the excavation.
4. After pruning, fill the area with quality topsoil and water until thoroughly soaked. Once exposed, roots must be covered within 8 hours. If roots are left exposed for longer than 8 hours, they must be kept moist using clean burlap or similar material.

3.6 INSTALLATION OF GEOGRIDS, FILTER FABRIC, MATTING, WOOD CHIPS AND OR MULCH

A. Install geogrids, filter fabric, matting, wood chips and or mulch in areas and depths shown on the plans and details or as directed in writing by Landscape Architect. In general it is the intent of this Section to provide the following levels of protection:

1. Provide a minimum of 5 inches of wood chips or mulch within the "Tree and Plant Protection Area".
2. Provide a layer of filter fabric under the 5 inches of wood chips or mulch areas where foot traffic or storage of lightweight materials is anticipated to be unavoidable.
3. Provide a layer of geogrid under 8 inches of wood chips or mulch in areas where occasional light vehicle traffic is anticipated to be unavoidable.
4. Provide a layer of geogrid under 8 to 12 inches of wood chips or mulch and a layer of matting over the wood chips or mulch.

B. Landscape Architectwill approve the appropriate level of protection.

C. In the above requirements, light vehicle 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 materials that can be physically moved by hand into the location. Bulk materials such as soil, or aggregate must never be stored within the "Tree and Plant Protection Area."

3.7 PROTECTION

A. Contractor must protect the "Tree and Plant Protection Area" at all times from compaction of the soil; damage of any kind to trunks, bark, branches, leaves and roots of all plants; and contamination of the soil, bark or leaves with construction materials, debris, silt, fuels, oils, and any chemicals substance. Notify Landscape Architect of any spills, compaction or damage and take corrective action immediately using methods approved by Landscape Architect.

3.8 GENERAL REQUIREMENTS AND LIMITATIONS FOR OPERATIONS WITHIN THE TREE AND PLANT PROTECTION AREA:

A. Contractor will not engage in any construction activity within the "Tree and Plant Protection Area" without written approval of Landscape Architect including: operating, moving or storing equipment; storing supplies or materials; locating temporary facilities including trailers or portable toilets. Contractor will not permit employees to traverse the area to access adjacent areas of the project or use the area for lunch or any other work breaks. Permitted activity, if any, within the "Tree and Plant Protection Area" is indicated on the Drawings along with any required remedial activity as listed below.

B. In the event that construction activity is unavoidable within the "Tree and Plant Protection Area," notify Landscape Architect and submit a detailed written Plan of Action for approval. The plan will include:

1. Statement detailing the reason for the activity including why other areas are not suited;
2. Description of the proposed activity;

3. Tthe time period for the activity,
4. List of remedial actions that will reduce the impact on the "Tree and Plant Protection Area" from the activity.

C. Remedial actions may include but are not be limited to the following:

1. In general, demolition and excavation within the drip line of trees and shrubs must proceed with extreme care either by the use of hand tools, directional boring or air tool excavation where indicated, or with other low impact equipment that will not cause damage to trees, roots or soil.
2. When encountered, exposed roots, 1 inch and larger in diameter will be worked around in a manner that does not break the outer layer of the root surface (bark). These roots will be covered in wood chips and will be maintained above permanent wilt point. Roots 1 inch and larger in diameter will not be cut without the approval of Landscape Architect. Excavation wil be tunneled under these roots without cutting them. In the areas where roots are encountered, work will be performed and scheduled to close excavations as quickly as possible over exposed roots.
3. Tree branches that interfere with construction activities may be tied back or pruned only to the point necessary to complete the work. Other branches may only be removed when specifically indicated by Landscape Architect. Tying back or trimming of branches and the cutting of roots will be in accordance with accepted arboricultural practices (ANSI A300 Part 8) and be performed under supervision of the Arborist.
4. Matting: Install temporary matting over the wood chips or mulch to the extent indicated. Do not permit foot traffic, scaffolding or the storage of materials within the "Tree and Plant Protection Area" to occur off of the temporary matting.
5. Trunk Protection: Protect the trunk of each tree to remain by covering it with a ring of 8 foot long, 2 inches x 6 inches planks loosely banded onto the tree with 3 steel bands. Staple the bands to the planks as necessary to hold them securely in place. Trunk protection must by kept in place no longer than 12 months. If construction activities require work near a particular tree to continue longer than 12 months, the steel bands will be inspected every 6 months and loosened if they are found to have become tight.
6. Air Excavation Tool: If excavation for footings or utilities is required within the "Tree and Plant Protection Area," air excavation tool techniques will be used where practical or as designed on the Drawings.
    a. Remove the wood chips from an area approximately 18 inches beyond the limits of the hole or trench to be excavated. Cover the wood chips for a distance of not less than 15 feet around the limit of the excavation area with filter fabric or plastic sheeting to protect the wood chips from silt. Mound the wood chips so that the plastic slopes towards the excavation.
    b. Using a sprinkler or soaker hose, apply water slowly to the area of the excavation for a period of at least 4 hours, approximately 12 hours prior to the work so that the ground water level is at or near field capacity at the beginning

of the work. For excavations that go beyond the damp soil, rewet the soil as necessary to keep soil moisture near field capacity.

c. Using an air excavation tool specifically designed and manufactured for the intended purpose, and at pressures recommended by the manufacturer of the equipment, fracture the existing soil to the shape and the depths required. Work at rates and using techniques that do not harm tree roots. Air pressure will be a maximum of 90 to 100 psi.

   1) The air excavation tool will be “Air-Spade” as manufactured by Concept Engineering Group, Inc., Verona, PA (412) 826-8800, or "Air Knife" as manufactured by Easy Use Air Tools, Inc. Allison Park, Pa (866) 328-5723 or approved equal.

d. Using a commercial, high-powered vacuum truck if required, remove the soil from the excavation produced by the air excavation tool. The vacuum truck should generally operate simultaneously with the hose operator, such that the soil produced is picked up from the excavation hole, and the exposed roots can be observed and not damaged by the ongoing operation. Do not drive the vacuum truck into the "Tree and Plant Protection Area" unless the area is protected from compaction as approved in advance by Landscape Architect.

e. Remove excavated soil and excavated wood chips, and contaminated soil at the end of the excavation.

f. Schedule the work so that foundations or utility work is completed immediately after the excavation. Do not let the roots dry out. Mist the roots several times during the day. If the excavated area must remain open over night, mist the roots and cover the excavation with black plastic.

g. Dispose of excess soil in a manner that meets local laws and regulations.

h. Restore soil within the trench as soon as the work is completed. Utilize soil of similar texture to the removed soil and lightly compact with hand tools. Leave soil mounded over the trench to a height of approximately 10% of the trench depth to account for settlement.

i. Restore geogrids, filter fabric, wood chips or mulch and or matting that was previously required for the area.

3.9 TREE REMOVAL

A. Remove trees indicated by the Drawings and specifications, as requiring removal, in a manner that will not damage adjacent trees or structures or compacts the soil.

B. Remove trees that are adjacent to trees or structures to remain, in sections, to limit the opportunity of damage to adjacent crowns, trunks, ground plane elements and structures.

C. Do not drop trees with a single cut unless the tree will fall in an area not included in the "Tree and Plant Protection Area." No tree to be removed within 50 feet of the "Tree and Plant Protection Area" will be pushed over or up-rooted using a piece of grading equipment.

D. Protect adjacent paving, soil, trees, shrubs, ground cover plantings and understory plants to remain from damage during all tree removal operations, and from construction operations. Protection will include the root system, trunk, limbs, and crown from breakage or scarring, and the soil from compaction.

E. Remove stumps and immediate root plate from existing trees to be removed. Grind trunk bases and large buttress roots to a depth of the largest buttress root or at least 18 inches below the top most roots which ever is less and over the area of three times the diameter of the trunk (DBH).

1. For trees where the stump will fall under new paved areas, grind roots to a total depth of 18 inches below the existing grade. If the sides of the stump hole still have greater than approximately 20% wood visible, continue grinding operation deeper and or wider until the resulting hole has less than 20% wood. Remove all wood chips produced by the grinding operation and back fill in 8 inch layers with controlled fill of a quality acceptable to Landscape Architect for fill material under structures, compacted to 95% of the maximum dry density standard proctor. Landscape Architect will approve each hole at the end of the grinding operation.

2. In areas where the tree location is to be a planting bed or lawn, remove all woodchips and backfill stump holes with planting soil as defined in Section Planting Soil, in maximum of 12 inch layers and compact to 80 to 85% of the maximum dry density standard proctor.

3.10 PRUNING

A. Within six months of the estimated date of Substantial Completion, Contractor will prune dead or hazardous branches larger than 2 inch in diameter from trees to remain.

B. Contractor will implement pruning recommendations found in the Arborist Report.

C. Contractor will prune low, hanging branches and vines from existing trees and shrubs that overhang walks, streets and drives, or parking areas as follows:

1. Walks - Within 8 feet vertically of the proposed walk elevation.

2. Parking Areas - Within 12 feet vertically of the proposed parking surface elevation.

3. Streets and Drives - Within 14 feet vertically of the proposed driving surface elevation.

D. Pruning will be done in accordance with ANSI A300 Part 1, ISA BMP Tree Pruning (latest edition), and the "Structural Pruning: A Guide for the Green Industry" by Edward Gilman, Brian Kempf, Nelda Matheny and Jim Clark, 2013 Urban Tree Foundation, Visalia CA.

E. Perform other pruning task as indicated on the Drawings or requested by Landscape Architect.

F. Where tree specific disease vectors require it, Contractor must sterilize pruning tools between the work in individual trees.

3.11 TREE GROWTH REGULATOR INJECTION (TGR)

A. If specified on the Drawings or as requested by Landscape Architect, Contractor will, at the start of the construction contract period, treat trees with Tree Growth Regulator (TGR) at recommended rates, time(s) of year, and by the method(s) indicated by the product distributor.

3.12 WATERING

A. Contractor will 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.

B. Contractor will adjust the automatic irrigation system, if available, and apply additional water, using hoses or water tanks as required.

C. Contractor will periodically test the moisture content in the soil within the root zone to determine the water content.

3.13 WEED REMOVAL

A. During the construction period, Contractor will control any plants that seed in and around the fenced "Tree and Plant Protection Area" at least 3 times a year.

1. Plants that are not shown on the planting plan or on the tree and plant protection plan to remain will be considered as weeds.

B. At the end of the construction period Contractor will provide one final weeding of the "Tree and Plant Protection Area."

3.14 INSECT AND DISEASE CONTROL

A. Monitor plants to remain for disease and insect infestations during the entire construction period. Provide disease and insect control required to keep the plants in a healthy state using the principles of Integrated Plant Management (IPM). Pesticides will be applied by a certified pesticide applicator.

3.15 CLEAN-UP

A. During tree and plant protection work, Contractor must keep the site free of trash, pavements reasonably clean and work area in an orderly condition at the end of each day. Remove trash and debris in containers from the site no less than once a week.

1. Immediately clean up any spilled or tracked soil, fuel, oil, trash or debris deposited as a result of Contractor's activities from within the project or on public right of ways and neighboring property.

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

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

D. Remove and dispose of excess mulch, wood chips, packaging, and other material brought to the site by Contractor.

3.16 REMOVAL OF FENCING AND OTHER TREE AND PLANT PROTECTION

A. At the end of the construction period, or when requested by Landscape Architect, Contractor will remove fencing, wood chips or mulch, geogrids and filter fabric, trunk protection and any other tree and plant protection material(s).

3.17 DAMAGE OR LOSS TO EXISTING PLANTS TO REMAIN

A. Grand, Heritage, Historic or other high value trees designated to remain and which are damaged by Contractor will be mitigated by Contractor at Contractor's own expense. Mitigation costs will be calculated by a third-party consulting arborist who is a registered Consulting Arborist® (RCA) with American Society of Consulting Arborists or an ISA Certified Arborist using the Reproduction Cost Method using the Trunk Formula Technique.

B. Trees or plants designated to remain and which are damaged by Contractor must be replaced in kind by Contractor at Contractor's own expense. Trees will be replaced with a tree of similar species and of equal size or 6 inch caliper which ever is less. Shrubs will be replaced with a plant of similar species and equal size or the largest size plants reasonably available which ever is less. Where replacement plants are to be less than the size of the plant that is damaged, Landscape Architect will approve the size and quality of the replacement plant.

1. Trees and plants will be installed per the requirements of Section 32 90 00 - Plantings.

C. Plants that are damaged will be considered as requiring replacement or appraisal in the event that the damage affects more than 25% of the crown, 25% of the trunk circumference, or root protection area, or the tree is damaged in such a manner that the tree could develop into a potential hazard. Trees and shrubs to be replaced will be removed by Contractor at Contractor's own expense.

1. Owner 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, or upon the request of Landscape Architect, will be immediately removed by Contractor at no additional expense to Owner. Tree removal will include all clean up of wood parts and grinding of the stump to a depth sufficient to plant the replacement tree or plant, removal of chips from the stump site and filling the resulting hole with topsoil.

E. Remedial work on damaged existing plants recommended by the consulting arborist will be completed by Contractor at no cost to Owner. Remedial work will 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 of tree growth regulators (TGRs).

F. Remedial work may extend up to 2 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

SECTION 01 57 13 - TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes furnishing, installing, maintaining, and removing at project completion, soil erosion and sedimentation control devices. Devices include silt fence, straw bales, turbidity barriers, temporary gravel construction entrance/exits, inlet filters, ditch sediment traps, etc.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 89 00 - Site Construction Performance Requirements

C. Section 31 22 00 - Grading

D. Section 31 23 13 - Subgrade Preparation

E. Section 31 23 19 - Dewatering

F. Section 31 23 33 - Trenching and Backfilling

G. Section 31 35 00 - Slope Protection

H. Section 32 92 19 - Seeding

I. Section 32 92 23 - Sodding

1.03 REFERENCE STANDARDS

A. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc-Type Apparatus

B. ASTM D4491/D4491M - Standard Test Methods for Water Permeability of Geotextiles by Permittivity

C. ASTM D4533/D4533M - Standard Test Method for Trapezoid Tearing Strength of Geotextiles

D. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

E. ASTM D4751 - Standard Test Methods for Determining Apparent Opening Size of a Geotextile

F. ASTM D6241 - Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile- Related Products Using a 50-mm Probe

1.04 REQUIREMENTS OF REGULATORY AGENCIES

A. Contractor will secure permits, and post bonds or deposits required to comply with the "Soil Erosion and Sedimentation Control," requirements, being Part 91 of PA 451 of 1994 as amended and the National Pollution Discharge Elimination System (NPDES) Rules for storm water discharges from construction activity.

B. Comply with requirements of the agency having jurisdiction. Owner may withhold payment to Contractor equivalent to any fines resulting from non-compliance with applicable regulations.

1.05 PERFORMANCE REQUIREMENTS

A. Employ Best Management Practices as defined by standard EPA 832-R-92-005.

B. Put preventative measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.

C. Control increased storm water runoff due to disturbance of surface cover due to construction activities for this Project.

D. Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this Project.

E. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall event that might occur in 10 years.

F. Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this Project. Prevent windblown soil from leaving the project site. Comply with fugitive dust ordinances of agencies having jurisdiction. Prevent tracking or flowing of mud and sediment onto public or private roads, sidewalks or pavements outside of the site.

G. Prevent sedimentation of waterways on or off the project site, including rivers, streams, lakes, ponds, open drainage ditches, storm sewers, and sanitary sewers. If sedimentation occurs, install or correct preventative measures immediately at no cost to Owner. Comply with requirements of agencies having jurisdiction.

H. Maintain temporary preventative measures until permanent measures have been established. Remove temporary measures when permanent measures have been established.

I. If erosion or sedimentation occurs due to non-compliance with these requirements, remove deposited sediment or restore eroded areas at no cost to Owner.

1.06 SUBMITTALS

A. Submit schedule of Soil Erosion and Sedimentation Control activities to agency having jurisdiction. Include events (with days and/or dates of the various activities) for review and approval prior to obtaining a permit.

B. Contractor must provide evidence of Storm Water Operator license.

PART 2 PRODUCTS

2.01 SILT FENCE

A. Polypropylene geotextile fabric, resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; meeting the following requirements:

1. Average Opening Size: 30 US std Sieve , maximum; ASTM D4751.

2. Permittivity: 0.05 sec-1, minimum; ASTM D4491/D4491M.

3. Ultraviolet Resistance: Retaining at least 70% of tensile strength; ASTM D4355/D4355M after 500 hours exposure.

4. Tensile Strength: 100 lb - f minimum, in cross-machine direction;124 lb - f minimum in machine direction; ASTM D4632/D4632M.
5. Elongation: 15 to 30%; ASTM D4632/D4632M.
6. Tear Strength: 55 lb - f minimum; ASTM D4533/D4533M.

B. Posts will be 2 inch cross section hardwood stakes, minimum 3 feet long.

2.02 TURBIDITY BARRIER

A. Geotextile fabric curtain suspended from flotation devices at the water surface and held in a vertical position by a ballast chain in the lower hem. Turbidity barrier curtain must meet the following minimum requirements unless otherwise specified on the plans.

1. Consist of vinyl laminate on 1000 denier polyester fabric weighing 18 oz per sq yard, minimum.
2. Tensile strength of fabric will be 220 lb - f, minimum.
3. Edges of fabric to be reinforced with minimum 5/8 inch diameter polypropylene rope.
4. Ballast chain minimum 5/16 inch galvanized steel.
5. Buoyancy blocks providing buoyancy of 18 lb - f.
6. Length of curtain (water depth) 5 feet.

2.03 DEWATERING DISCHARGE FILTER BAG

A. UV-stabilized, non-woven geotextile bag to filter sediment from water prior to discharging. Geotextile fabric must meet the following minimum average roll requirements:

1. Tensile Strength: 180 lb - f minimum; ASTM D4632/D4632M
2. Elongation: 50 percent minimum; ASTM D4632/D4632M
3. CBR Puncture Strength: 300 lb f; ASTM D6241
4. Trapezoidal Tear: 70 lb - f; ASTM D4533/D4533M
5. Flow Rate: 80 gal/min/sft Minimum; ASTM D4491/D4491M
6. Permittivity: 1.4 sec -1 minimum; ASTM D4491/D4491M
7. Apparent Opening Size: 80 US std Sieve; ASTM D4751
8. UV-Stability: 70% retained strength; ASTM D4355 after 500 hours.

2.04 EROSION CONTROL BLANKETS

A. Erosion control blankets will not be used on this project. In lieu of these blankets, the Contractor will stabilize the seeded areas using straw crimped into the ground using a mulch anchoring tool (disc with vertical coulters) or by hydroseeding with a cellulose or wood fiber mulch.

2.05 BONDED FIBER MATRIX

A. Bonded fiber matrix (BFM) will consist of long strand, residual, softwood fibers joined together by a high-strength, nontoxic adhesive. BFM will be 100% biodegradable, and be non-toxic to fish, wildlife, and humans. Upon drying the matrix will form a high strength, porous and erosion resistant mat that will not inhibit the germination and growth of plants. BFM will retain its form despite re-wetting.

B. Bonded fiber matrix will consist of:

1. Seed and Fertilizer per Section 32 92 19.

2. Wood Fiber Mulch: Thermo-mechanically defibrated long, softwood fibers manufactured from select northern softwood wood chips.

3. Polyacrylamide Binder: Site specific, fully biodegradable, polyacrylamides (PAM's) binders, with cross-linking long organic jute fibers

C. Materials will be mixed at the rate of 80 lbs per acre of PAM binder and 2500 lbs per acre of wood fiber mulch.

2.06 INLET FILTER FABRIC

A. Filter fabric will be constructed of 100% continuous polyester needle-punched non-woven engineering fabric. Filter fabric will be fabricated to provide a direct fit with the drainage structure cover. Filter fabric will have the following minimum physical properties.

B. Tensile Strength:80 lb - f minimum; ASTM D4632/D4632M

C. Elongation: 50 percent minimum; ASTM D4632/D4632M

D. CBR Puncture Strength: 300 lb - f minimum; ASTM D6241

E. Trapezoidal Tear: 70 lb - f minimum; ASTM D4533/D4533M

F. Flow Rate: 80 gal/min/sft minimum; ASTM D4491/D4491M

G. Permittivity: 1.4 sec -1 minimum; ASTM D4491/D4491M

H. Apparent Opening Size: 100 US std Sieve maximum; ASTM D4751

I. UV-Stability: 70% retained strength; ASTM D4355/D4355M after 500 hours.

2.07 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers include the following:

1. Turbidity Barrier: Tough Guy Type II by Aer-flo Canvas Products, Inc.

2. Wood Fiber Mulch: EcoFibre by Canfor Corporation.

3. Polyacrylamide Binder: HydroTurboNet by Straw Net, Inc.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to the greatest extent possible.

B. Except in areas to be cleared, do not remove, cut, deface, injure or destroy trees or shrubs without Landscape Architect's approval. Protect existing trees or shrubs that are to remain and which may be injured, bruised, defaced, or otherwise damaged by construction operations, with suitable fences or other means as approved by Landscape Architect.

3.02 PREPARATION

A. Review the drawings and Storm Water Pollution Prevention Plan (SWPPP).

B. Revise SWPPP as necessary to address potential pollution from site identified after issuance of the SWPPP at no additional cost to Owner.

C. Conduct storm water pre-construction meeting with Site Contractor, all ground-disturbing Subcontractors, site Engineer of record or someone from their office familiar with the site and SWPPP, and state or local agency personnel in accordance with requirements of the special conditions.

D. Schedule work so that the soil surfaces are left exposed for the minimum amount of time. Place permanent soil and sedimentation control measures as soon as practical.

3.03 GENERAL

A. Do not discharge excavation ground water to the sanitary sewer, storm sewer, or to rivers, streams, etc. without authorization from the agency having jurisdiction. Construction site runoff will be prevented from entering any storm drain, river, stream, etc. directly by the use of silt fences or other suitable methods. Contractor will provide erosion protection of surrounding soils.

B. Sedimentation control devices will be installed prior to Contractor beginning Work. Soil erosion and sedimentation control devices must be maintained in an effective functioning condition at all times during the course of the Work.

C. Immediately bring earthwork to final grade and protect side slopes and backslopes from erosion. Plan and conduct earthwork to minimize duration of exposure of unprotected soils.

3.04 INSTALLATION - GENERAL

A. Install silt fences, ditch sediment traps, check dams, inlet filters, temporary gravel construction entrance/exits, turbidity barriers, erosion control blankets and other soil erosion control devices in accordance with the drawings and Storm Water Pollution Prevention Plan, or as may be dictated by site conditions in order to maintain the intent of the specifications and permits.

B. Deficiencies or changes on the drawings or SWPP must be corrected or implemented as site conditions change. Changes during construction must be noted in the SWPP and posted on the drawings.

C. Owner has authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and embankment operations and to direct Contractor to provide immediate permanent or temporary pollution control measures.

D. Remove temporary control devices after permanent measure are established. Remove and replace temporary control devices if they become ineffective at no additional cost to Owner.

E. Contractor will incorporate permanent erosion control features, paving, permanent slope stabilization, and vegetation into project at earliest practical time to minimize need for temporary controls.

F. Contractor will permanently seed and mulch cut slopes as excavation proceeds to extent considered desirable and practical.

3.05 DUST CONTROL

A. Keep dust down at all times, including during non-working periods. Sprinkle or treat, with dust suppressants, the soil at the site, haul roads, and other areas disturbed by operations. Dry power brooming is not permitted.

3.06 APPLICATION OF BONDED FIBER MATRIX

A. The slope will be prepared and graded prior to application of Bonded Fiber Matrix (BFM). Mixture of wood fiber mulch and polyacrylamide binder will be blended, with the appropriate amount of seed and fertilizer per Section 32 92 19, according to manufacturer's recommendations.

B. BFM will be hydraulically applied to the soil as a viscous mixture, crating a continuous, three-dimensional blanket that adheres to the soil surface. BFM will be mixed and applied at the rate as specified in this Section unless otherwise indicated on the Plans.

C. The resulting coverage must be at least 1/8 inch thick over the entire surface area. BFM will be applied in two applications from alternate directions to eliminate shadowing and will be applied when no rain is expected for 12 hours.

3.07 DEWATERING DISCHARGE

A. Should it be necessary for Contractor to do any dewatering during the course of construction, Contractor will filter discharge through a discharge filter bag or other sediment control device that will filter all discharge water.

B. No dewatering discharge will be allowed to flow unfiltered from the construction site.

3.08 MAINTENANCE

A. Maintain temporary erosion and sedimentation control systems as dictated by site conditions, indicated in the construction documents, or as directed by governing authorities or Owner to control sediment until final stabilization.

B. Contractor must respond to maintenance or additional work ordered by Owner or governing authorities immediately, but in no case, within not more than 48 hours if required at no additional cost to Owner.

3.09 INSPECTION

A. General:

1. Contractor is responsible to obtain and/or serve as the Certified Operator.

a. Weekly inspections are to be conducted by Contractor as a minimum, and after every rainfall event. A copy of the inspection report will be submitted to the agency having jurisdiction, as well as Owner and Landscape Architect.

2. Inspections will be performed by a person familiar with the site, the nature of the major construction activities, and qualified to evaluate both overall system performance and individual component performance.

3. Inspector must either be someone empowered to implement BMPs in order to increase effectiveness to an acceptable level or someone with the authority to cause such things to happen.

4. Inspector must be certified as a “Storm Water Professional” through the EGLE storm water training program. Additionally, the inspector will be properly authorized in accordance with the applicable General Permit to conduct the certified site storm water inspections.

B. Inspection Frequency Reduction:

1. Inspection frequency may be reduced under the following conditions:

a. No active onsite construction activities.

b. Temporary cover has been provided across the entire site and no BMPs remain.

1) Situation: waiting for grass to grow, but grass is dormant.

c. Ground is frozen and/or snow covered.

C. Weekly Storm Water Meeting:

1. A weekly storm water meeting will be held by Contractor with those involved in ground-disturbing activities to review the requirements of the permits, the SWPPP, and address any problems that have arisen in implementing the SWPPP or maintaining the BMPs.

2. Contractor will maintain a log of weekly meetings and document the issues addressed in the meetings on site.

D. Agency Storm Water Inspections:

1. A log of inspections by federal, state, or local storm water or other environmental agencies will be kept in Contractor’s SWPPP.

2. The log form should include the date and time of visit and whether a report was issued or will be issued as a result of the inspection.

3. Any reports issued will be sent to Landscape Architect within 24 hours.

3.10 PROJECT COMPLETION

A. Remove temporary soil erosion and sedimentation control devices as soon as permanent measures have been established.

END OF SECTION

SECTION 01 58 13
TEMPORARY PROJECT SIGNAGE

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section includes the requirements for the provision of temporary project signage to be provided at the site by the Contractor.

B. Contractor will provide labor, equipment, materials, and incidentals necessary to provide temporary project signage at the project site.

C. Contractor will maintain the temporary project signage throughout the duration of the Contract through Final Completion.

D. Contractor will remove the temporary project signage from the project site prior to final payment.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 11 00 - Summary of Work

B. Section 01 33 00 - Submittal Procedures

1.3 REFERENCE STANDARDS

A. FHWA (SHS) - Standard Highway Signs and Markings; 2004, with Supplement (2012).

1.4 ADMINISTRATIVE REQUIREMENTS

A. Contractor will coordinate with the Owner to determine the location(s) of project signage at the project site.

1.5 QUALITY ASSURANCE

A. Design sign and supports to withstand 50 miles/hr wind velocity.

B. Sign Painter: Experienced as a professional sign painter for minimum three years.

C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction activities.

1.6 REQUIRED SIGNAGE

A. Contractor will furnish, install and maintain the following signs throughout the duration of this Contract:

1. Project identification sign.
2. Traffic routings signs that show the Contractor’s personnel, including but not limited to the subcontractors, suppliers, and delivery companies the Owner-approved routes for construction traffic at the facility.
3. Parking areas for the Contractor’s personnel, including but not limited to its subcontractors, suppliers, and delivery companies at the Owner-approved areas for Contractor parking.
4. Contractor and subcontractors field trailers.

5. Owner’s field trailer.
6. Safety signs as required by federal and State of Michigan OSHA and local laws, regulations, codes, standards, rules, and requirements.

1.7 SUBMITTALS

A. Submit shop drawings of the required project signs specified in this Section to show the following:

1. Materials of construction and installation details.
2. Removal details and restoration methods to demonstrate to Owner that areas affected by signage will be restored to original conditions or better.
3. Drawing of sign to show content of sign along with the text font type, font size, line spacing.
4. Proposed locations for each sign type.

PART 2 PRODUCTS

2.1 PERFORMANCE

A. Project Identification Sign:

1. Contractor is responsible for furnishing high-quality project signs. Materials of construction must be durable and designed and installed suited for the environment they are installed. The sign will be in color and bear the following information:

a. Project number, title and name of the Owner as shown on the Contract Documents.

b. Owner’s logo.

c. Names and titles of Owner's key staff or designated personnel.

d. Names of Landscape Architect.

e. Name of Contractor.

2.2 SIGN MATERIALS

A. Structure and Framing: New, wood, structurally adequate.

B. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inch thick, standard large sizes to minimize joints.

C. Project sign will be 3/4 inch exterior grade medium density overlay (MDO) board with digitally printed graphics.

D. Post and braces will be exterior grade pressure treated lumber.

E. Signs will be installed and secured to withstand heavy winds so that signage does not become loose or otherwise unsafe.

F. Signs will be fabricated and installed so that there are no sharp edges or otherwise pose harm to personnel health and safety.

G. Outdoor signs will be reflective an installed at a lighted location of high public visibility, adjacent to main entrance.

H. Indoor signs will be installed in a lighted location.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install project identification sign within 30 days after date fixed by Notice to Proceed.

B. Install sign surface plumb and level, with butt joints. Anchor securely.

C. Paint exposed surfaces of sign, supports, and framing and surface material; one coat of primer and one coat of exterior paint.

3.2 MAINTENANCE

A. Maintain signs and supports in a neat, clean condition; repair damages to structure, framing or sign.

B. Signage that becomes deteriorated or otherwise unsatisfactory to the Owner will be replaced with new at the Contractor’s expense.

3.3 REMOVAL

A. Remove signs, framing, supports, and foundations at completion of Project and restore the area.

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 TRANSPORTATION AND HANDLING

A. Contractor will provide for expeditious transportation and delivery of materials and equipment to the Project site in an undamaged condition and on a schedule to avoid delay of the Work. Materials and equipment will be delivered in original containers or packaging with identifying labels intact and legible.

B. Contractor will provide equipment and personnel at the site to unload and handle materials and equipment in a manner to avoid damage. Materials and equipment must be handled only at designated lifting points by methods to prevent bending or overstressing.

1.2 STORAGE AND PROTECTION

A. Store materials and equipment immediately on delivery, and protect it until installed in the Work.

B. Store products subject to damage by elements in weather-tight enclosures with temperature and humidity ranges as required by manufacturer's instructions.

C. Store loose granular materials on solid surfaces to prevent mixing with foreign matter.

D. Locate the place of storage so as to minimize interference with traffic and to provide easy access for inspection. Do not store materials closer than 5 feet (1.5 meters) to the edge of pavement or traveled way open to the public.

E. Materials that have been stored are subject to retest and must meet the requirements of their respective specifications at the time they are to be used in the Work.

F. Provide protection of stored or installed materials and equipment as necessary to prevent damage from traffic and subsequent operations.

1.3 MANUFACTURER'S INSTRUCTIONS

A. Obtain and distribute copies of manufacturer's instructions when the Contract Documents require that installation of Work to comply with manufacturer's instructions. Distribute copies of such instructions to parties involved in the installation, as well as at least 1 copy to the Landscape Architect.

B. Handle, install, connect, clean, condition and adjust products in strict accord with such instructions and in conformity with specified requirements. Should project conditions or specified requirements conflict with manufacturer's instructions, consult with Landscape Architect for further instructions.

1.4 PRODUCTS LIST

A. Submit a complete list of major products to be used within 4 days, if requested by Landscape Architect. The list will include the name of the manufacturer and the installing subcontractor, if applicable.

1.5 CONTRACTOR'S PRODUCT OPTIONS

A. Select any product meeting the standard for products specified only by reference standard.

B. For products specified by naming several products or manufacturer's, select any one of the products or manufacturers named, which complies with the specifications.

C. For products specified by naming one or more products or manufacturers and "or equal," submit a Substitution Request Form for any product or manufacturer not specifically named, in accordance with Section 00 72 00 - General Conditions.

D. For products specified by naming only one product and manufacturer, there is no option.

1.6 EQUIPMENT STARTUP AND TESTING

A. Perform a comprehensive startup and demonstration of equipment performance and compliance with the design requirements. When there is more than one mode of operation, the equipment will be operated in every mode to verify proper operation.

B. When equipment is to operate in conjunction with other equipment as a system, each piece of equipment will be operated both by itself and automatically as a system to verify its proper operation.

C. Contractor is to provide to the Landscape Architect, in advance of startup, a schedule and listing of startup and testing procedures for review by the Landscape Architect. Checklists and diagrams may be required to ensure adequate startup and testing. Landscape Architect may recommend changes to the startup procedure as necessary.

D. Equipment is to be inspected prior to operation for debris or other obstructions. Equipment is to be properly lubricated and calibrated prior to operation. Contractor will make adjustments necessary to ensure correct operation. When required, equipment installation and operation is to be witnessed and checked by manufacturer.

E. When required, the Contractor will train the Owner’s operation and maintenance personnel in the proper operation and maintenance of each piece of equipment and the system as a whole.

F. Equipment startup is to be witnessed by the Owner and the Landscape Architect.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 71 23.26
CONSTRUCTION LAYOUT AND STAKING

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Contractor will furnish labor, materials, tools and equipment necessary to perform construction layout, control, and reference staking for satisfactory completion of the project. This includes, but is not limited to:

1. Placing, replacing (if necessary), and maintaining construction layout points;
2. Preparing construction layout drawings, sketches, and computations; and
3. Recording data in field books such as alignment, slope stake, blue top, drainage layout, bridge, and other books used for layout for this Project.

1.2 SUBMITTALS

A. Submit the following documentation in accordance with Section 01 33 00 - Submittal Procedures.

1. Project Construction Records:
    a. These records detail information that Landscape Architect uses to determine the template line for the as-built cross sections, which defines the computation line for unclassified excavation. These records include:
        1) Survey records
        2) Bound field notebooks
        3) Computer printouts that record the Project’s construction
2. Survey Documents:
    a. Furnish the Landscape Architect with a copy of survey documents that relate to construction layout. Provide these documents when Landscape Architect requests, or as they are completed. Landscape Architect may check the documents for accuracy and may require revisions where necessary. The documents become property of Owner and will be included in the permanent Project records.

1.3 QUALIFICATIONS

A. Personnel:

1. Perform staking under the direct supervision of a Land Surveyor licensed by the State in which the Project is located,
2. Furnish personnel, working under the supervision of a Registered Professional Engineer or Registered Land Surveyor, who are fully qualified and capable of establishing or reestablishing line and grade points necessary to complete the work within the generally accepted surveying tolerances, and ensure that they are acceptable for the work being performed.

B. Equipment:

1. Equipment will be of a quality and condition to provide the required accuracy. The equipment will be maintained in good working order and in proper adjustment. Records of repairs, calibration tests, accuracy checks and adjustments must be maintained and be available for inspection by Landscape Architect. Equipment will be checked, tested, and adjusted as necessary in conformance with manufacturer's recommendations.

PART 2 PRODUCTS (NOT USED)

2.1 HUBS

A. Hubs will be 1-1/2 inch x 1-1/2 inch x 16 inch oak and witness stakes be 1 inch x 1 inch x 36 inch oak or other hardwood.

B. Hubs with tacks will be used for control points, centerline or baseline offsets and structure stakeout and will be accompanied by witness stakes marked with the pertinent information. For supplemental stakeout only, witness stakes alone may be used. For laser grade control and the verification of the laser elevation a hub with witness be provided.

PART 3 EXECUTION

3.1 PREARATION

A. General Pre-Construction:

1. Before beginning construction ensure that plan dimensions, alignment, and elevations are compatible with existing field conditions. Make adjustments where necessary.

2. Ensure alignment tie-ins by coordinating construction layout with that of other contractors whose work abuts any portion of the work. Adjustments are subject to Landscape Architect's approval.

B. Widening and Reconstruction:

1. Before beginning construction where existing pavement is to be retained, either for widening or for reconstruction:

   a. Take three-point levels of the pavement throughout the length to be retained. Normally, the three-point levels will be required at 50 ft (15 m) intervals. However, Landscape Architect may adjust these intervals according to existing field conditions.

   b. From the three-point levels, prepare a graphic grade plot that "best fits" the existing pavement to minimize the leveling requirements (if any) of the existing roadway. Cross slopes may be varied within the ranges shown on the Plans or adjusted by Landscape Architect to produce the "best fit."

2. On passing lane or widening projects where existing pavement is not to be overlaid:

   a. Profile and plot the outside edge of the existing pavement to obtain a smooth profile grade.

   b. Transfer this grade to the new edge of paving using the proper cross slope.

c. Furnish data to Landscape Architect for approval before beginning widening and reconstruction.

3. On widening, reconstruction, or passing lane projects, obtain Landscape Architect's approval of the "best fit" profile. Ensure that grade stakes are set to control the construction of any required widening based upon the "best fit" profile and cross slope. Construct proposed widening flush with the existing edge of paving. Provide positive drainage in all cases.

C. Existing Bridge Widening or Modification:

1. To widen or modify existing bridges, do the following before ordering materials or beginning construction:

a. Verify existing elevations and dimensions as well as confirm or determine required new cap elevations.

2. Profile the removal line and cross section the existing deck.

a. Use this profile information to determine a "best fit" finished grade for the widened portion.

b. Compute the new cap elevations based on this "best fit" information.

c. Furnish survey data, layout sketch, and calculations to Landscape Architect for approval.

D. Retaining Wall Construction Layout:

1. Set stakes, take necessary cross sections, and perform necessary calculations at each wall before beginning wall construction to ensure that the geometric design of the retaining wall conforms to actual conditions.

E. Limits of Clearing and Grubbing:

1. The boundary of the area(s) to be cleared and grubbed will be staked or flagged at a maximum interval of 200 feet, closer if needed, to clearly mark the limits of work. When Contractor staking is the basis for determining the area for final payment, all boundary stakes will be reviewed by the Landscape Architect before start of this work item.

F. Excavation and Fill:

1. Place slope stakes at the intersection of the specified slopes and ground line. Slope stakes and the reference stakes for slopes will be marked with the stationing, required cut or fill, slope ratio, and horizontal distance from the centerline or other control line.

G. Structures:

1. Centerline and offset reference line stakes for location, alignment, and elevation will be placed for all structures.

3.2 GENERAL

A. Verify plan elevations for all bridge bearing seats on the substructure.

B. Verify bent layout at each major phase of the construction to ensure that the bent is properly positioned in relation to adjacent bents.

C. Establish the Centerline:

1. Establish or reestablish the centerline from the monuments and/or reference points provided by Owner.

2. On widening or reconstruction Projects, establish the horizontal and vertical alignment of the existing roadway and bridges.

3. Modify the Plan horizontal and vertical alignment to conform to the existing alignment as necessary.

D. Verify the Accuracy of the Benchmark(s):

1. Owner will furnish at least one benchmark that Contractor will preserve, and if necessary, relocate as follows:

a. Verify the accuracy of the benchmark(s) and report discrepancies to Landscape Architect.

b. Establish additional benchmarks needed for construction.

c. Maintain the benchmarks for necessary Owner checks.

E. Flag In-Place Survey Control Monuments:

1. Flag and protect in-place survey control monuments and reference points, including Right-of-Way/property line intersections, as follows:

a. Pay for and replace destroyed or disturbed stakes or monuments.

b. When included as Pay Items, stake Right-of-Way markers.

F. Line, Grades, and Stakes:

1. Set other line and grade stakes needed to construct the job, including stakes needed to relocate utilities and restake flattened slopes, minor grade or alignment changes, and other incidentals.

G. Stake Centerline Control Alignments:

1. Stake centerline control alignments shown on the Plans or adjusted as described above when Landscape Architect needs accurate measurement of quantities for payment. Stake these control alignments as follows:

a. Stake the alignments to an accuracy of 1:5000.

b. Stake alignments just before Landscape Architect takes aerial photography or field cross sections for both original and final cross sections.

c. Take intermediate cross sections required because of stage construction, detours, or other reasons.

H. Provide Graphic Sketches:

1. Prepare and use graphic sketches of superelevation runout on curves on multi-lane roadways and of tie-ins of ramps to mainline on freeways and expressways to help

provide positive drainage, adequate superelevation, and a pleasing appearance. Prepare and use similar sketches for street or roadway intersections.

I. Maintain the Stakes:

1. After construction has begun in any segment of the Project, maintain the stakes that identify construction station numbers and locations as follows:

   a. Ensure that stakes are placed at intervals not to exceed 200 feet (60 m) and use even, 100 feet (30 m) stations. Mark and flag stakes so that they are visible to Landscape Architect in that segment of the Project until construction is complete.

   b. During grading activities in fills or cuts over 20 feet (6 m), extend slope stakes up or down the slopes in intervals of 10 feet (3 m) or less to achieve an accurate cross section.

J. Traffic Markings:

1. When traffic markings are to be placed by either Contractor or others, furnish the layout and clean and preline the surface to allow the placement of permanent pavement markings on the Project.

2. When traffic markings are not included in the Project plans, Landscape Architect will provide striping plans and/or standard drawings for Contractor’s use.

K. Provide Bridge Construction Layout:

1. Provide alignment control, grade control, and calculations to set these controls for bridge construction.

2. For new bridges, Landscape Architect will furnish the necessary input data upon Contractor’s request. Landscape Architect will process the data to help the Contractor obtain finished deck elevations.

3. Data processing is available only as an alternate service to determine elevations. If this service is elected for use, prepare the input data and Landscape Architect will furnish the output data. The following limitations apply:

   a. Landscape Architect will not assume liability for the accuracy of either input or output data.

   b. Landscape Architect will limit this service to two programs per bridge. This service is not available for existing bridges that are to be widened. Finished deck elevations for bridges that are to be widened will not be furnished.

3.3 QUALITY ACCEPTANCE

A. Landscape Architect’s acceptance of Contractor’s layout will not relieve Contractor of responsibility to secure proper dimensions for the completed work. Contractor will, at Contractor's own expense, correct work incorrectly located due to layout error.

END OF SECTION

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 CLEANING

A. Contractor will perform periodic cleaning to keep the Work, the site and adjacent properties free from accumulations of waste materials, rubbish and wind-blown debris, resulting from construction operations.

B. Waste material, debris and rubbish will be periodically removed from the site and disposed of at legal disposal areas away from the site.

C. Prior to Owner acceptance, Contractor will conduct an inspection of sight-exposed interior and exterior surfaces, and Work areas, to verify that the entire Work is clean.

D. Contractor will broom clean exterior paved surfaces and rake clean other exterior surfaces of the site.

1.02 PROJECT RECORD DOCUMENTS

A. Contractor will deliver one (1) copy of all Specifications, Plans, Addenda, Shop Drawings and Samples, annotated to show changes made during the construction process, to Landscape Architect upon completion of the Work as record documents. Submittal of the record documents will be made with a transmittal letter containing:

1. Date
2. Project Title and Number
3. Contractors Name and Address
4. Title and Number of each Record Document
5. Certification that each Document as submitted is complete and accurate

B. Record Documents will include:

1. Annotations, including changes during the execution of the work resulting from Requests of Information, Field Orders, Change Directives, and the as-built conditions which differ from the proposed plans.
    a. Annotations will include dimensional changes from the proposed plans. Where different from the proposed plans, strike through the proposed dimension and provide the as-built dimension. Changes will be clouded.
    b. Annotations may also be accompanied by sketches, photos, etc., as appropriate, to demonstrate as-built information or conditions.
2. Underground utilities installed as part of the Project and utilities exposed during execution of the Work. Underground utilities will be surveyed to record their location and elevation. Utiliity locations will be based upon available Project data (i.e., coordinate system, benchmarks, etc.).
    a. The utility information will include:

1) Straight run data every 100-feet.

2) Bends, valves, fittings, wyes/tees, hydrants, etc.

3) Crossings of other utilities.

C. Record documents will be in Portable Document Format (pdf), full size (i.e., 22" x 34"), in good order and in a legible condition.

D. Prior to delivery of the project record documents, Contractor will submit draft updates on a monthly basis to Landscape Architect for review.

1.03 OPERATION AND MAINTENANCE DATA

A. Prior to final inspection or acceptance, Contractor will fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of products, equipment and systems specified in the Contract Documents.

B. Operation and maintenance data required by the individual Specification sections and the manufacturer's operation and maintenance data required in Section 01 33 00 - Submittal Procedures, will constitute the basis of such instruction.

1.04 START UP

A. Contractor will coordinate efforts between Owner, Landscape Architect, any equipment manufacturers, subcontractors and governing agencies in the start up of applicable portions of the Work.

1.05 WARRANTIES

A. Provide written warranties from the manufacturerfor major equipment supplied under this Contract. The manufacturer’s warranty period will be concurrent with the Contractor’s warranty period. The warranty from the manufacturer will not relieve the Contractor of the one-year warranty starting at the time of Project Substantial Completion. Owner can request written warranties for equipment not classified as major.

1.06 SUBSTANTIAL COMPLETION

A. Certification that the Work is substantially complete will be in accordance with the General Conditions.

1.07 FINAL PAYMENT AND ACCEPTANCE

A. The final inspection, final application for payment and acceptance will be in accordance with the General Conditions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 89 00
SITE CONSTRUCTION PERFORMANCE REQUIREMENTS

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section includes general performance requirements for earthwork complete with, removal and disposal of structures and obstructions, protection of existing sewers, tiles and mains; protection of existing building and improvements, protection of trees and other types of vegetation, protection of utility lines, requirements for pavement replacement, restoration of driveways and parking areas, restoration of sidewalks, restoration of lawns and disturbed areas, transportation and disposal of excess excavation.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 57 13 - Temporary Erosion and Sediment Control

B. Section 31 23 13 - Subgrade Preparation

C. Section 31 23 16 - Structural Excavation and Backfill

D. Section 31 23 19 - Dewatering

E. Section 31 23 33 - Trenching and Backfilling

F. Section 32 12 16 - Bituminous Paving

G. Section 321313 - Concrete Paving

H. Section 32 13 15 - Sidewalks and Driveways

I. Section 32 92 19 - Seeding

J. Section 32 92 23 - Sodding

1.3 REFERENCE STANDARDS

A. Unless otherwise specified, the Work for this Section will conform to the applicable portions of the following Standard Specifications:

1. MDOT - Michigan Department of Transportation Standard Specifications for Construction, latest edition.

2. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort

1.4 REQUIREMENTS OF REGULATORY AGENCIES

A. Comply with Section 01 57 13 - Temporary Erosion and Sediment Control. Contractor, at Contractor's expense, will secure all permits, and post all bonds or deposits required to comply with the Soil Erosion and Sedimentation Control, requirements, being Part 91 of PA 451 of 1994 as amended.

B. Comply with all requirements of theNational Pollutant Discharge Elimination System (NPDES) Storm Water Program for Construction Activities, Part 31 of PA 451 of 1994 as amended.

C. Provide, maintain and remove such temporary and/or permanent Soil Erosion and Sedimentation Control (SESC) measures as specified on the Plans or as determined by the Landscape Architect.

1. Measures will prevent surface runoff from carrying excavated materials into the waterways, reduce erosion of the slopes, and prevent silting in of waterways downstream of the Work.

2. Measures should include provisions to reduce erosion by the wind of areas stripped of vegetation, including material stockpiles.

1.5 SUBMITTALS

A. Written permission for the use of disposal and borrow sites must be obtained and copies will be furnished to the Landscape Architect.

1.6 PROTECTION OF PLANT LIFE

A. Trees, shrubs, and other types of vegetation not within the limits of the Work or not designated on the Plans or by the Landscape Architect to be removed, will be carefully protected from damage or injury during the various construction operations.

B. Trees, shrubs or other types of vegetation not designated to be removed but which is damaged by the Contractor's operation will be repaired or replaced by the Contractor, at Contractor's expense, as determined by the Landscape Architect.

1.7 PROTECTION OF EXISTING STRUCTURES AND IMPROVEMENTS

A. Carefully protect existing culverts, sewers, drainage structures, manholes, water gate wells, hydrants, water mains, utility poles, overhead lines, underground conduits, underground cables, pavement, or other types of improvements within the construction limits, not designated on the Plans to be removed from damage during the construction operations.

B. Repair or replace existing structure or improvement not designated to be removed that are damaged by the Contractor's operations to the satisfaction of the structure owner, at Contractor's expense.

C. Deposits of dirt or debris in sewers, culverts, tiles, drainage structures, manholes, gate wells, etc. caused by the Contractor at the Contractor’s expense.

1.8 MAINTAINING DRAINAGE

A. Maintain existing open drains, field and roadway ditches, drainage tile, sewers, enclosed drains, natural and artificial watercourses, surface drainage or any other types of drainage within the limits of the Work to for continued free discharge during construction. Costs incurred will be incidental to the excavating, backfilling and compacting or grading operations.

B. Repair or replace drainage facilities not designated to be abandoned, but which are damaged, or interrupted by the Contractor's operation immediately at Contractor's expense.

PART 2 PRODUCTS

2.1 GRANULAR MATERIAL

A. Bank run sand must meet the requirements of MDOT, Granular Material Class II.

2.2 AGGREGATE FOR SHOULDERS, PARKING AREAS, DRIVEWAYS OR ROADS

A. Crushed limestone, natural aggregate or slag msut meet the requirements MDOT Section 902.

PART 3 EXECUTION

3.1 DEWATERING

A. Dewater the area within the vicinity of the new Work prior to commencing any construction activities. The depth of the dewatering will be sufficient to allow the Work area to remain in a dry condition during the various construction operations.

B. The costs incurred for furnishing, installing, maintaining and removing the dewatering equipment will be at the Contractor's expense unless otherwise specified.

C. Refer to Section 31 23 19 - Dewatering for additional requirements.

3.2 GENERAL

A. Construction operations will be restricted to the existing right-of-way or the areas indicated on the Plans. If the Contractor requires additional area, the Contractor must furnish the Landscape Architect with written permission obtained from the property owner for any part of the operation the Contractor plans to conduct outside of the right-of-way or limits indicated.

1. Permission must be granted by the property owner prior to commencing any construction activities or operations outside of the existing right-of-way or designated areas.

3.3 EXISTING IMPROVEMENTS

A. Expose existing sewers and structures to which the new Work is to be connected and notify the Landscape Architect once exposed. Landscape Architect will verify the vertical and horizontal locations of the existing system and will inform the Contractor as to the necessary adjustments required to align the new Work with the existing system.

3.4 EXISTING UTILITIES

A. When existing utilities are shown on the Plans, their locations are approximate only, as secured in the field investigation and/or from available public records. Contractor, prior to the start of construction, must contact 811 and the public agency or utility having jurisdiction to request the verification of all utilities within the construction area.

B. When existing utility lines, structures or utility poles are encountered during the performance of the Work, the Contractor, at Contractor's expense, will perform construction operations in such a manner that the service will be uninterrupted.

C. Expose all existing utility lines prior to any excavation operation, to determine any conflict with the proposed improvement. Contractor is responsible for any relocation required as a result of any conflict of existing utilities shown on the Plans, with the proposed improvement.

D. Should it become necessary to move any utility structure, line or pole shown on the Plans or otherwise found necessary to be moved, the Contractor will make all arrangements with the owner of the utility for the moving. Costs incurred for such moving will be at the Contractor's expense unless indicated otherwise.

1. Before disturbing a utility line, structure or pole, furnish the Landscape Architect with satisfactory evidence, in writing, that proper arrangements have been made with the owner of the utility.

3.5 UTILITY POLES

A. Contractor is responsible for removal or relocation of existing utility poles (including street light poles, guy poles, telephone poles, etc.) required as a result of any conflict with proposed improvements.

B. Arrangements for removing or relocating utility poles with the owner of the utility pole will be the Contractor's responsibility.

C. Prior to disturbing any utility pole, the Contractor will provide the Landscape Architect with written evidence that proper arrangements have been made with the owner of the utility pole.

D. When required by the Work, Contractor will temporarily support poles in the vicinity of the Work, or make arrangement for the utility power owner to temporary support the poles, at no additional cost to the Owner.

1. Support provided by the Contractor will be in accordance with and to the satisfaction of the utility company.

3.6 EXISTING SEWERS, TILE, AND MAINS

A. Restore existing sanitary sewers, storm sewers, drain tile, septic tank bed tiles, water mains or building services or leads, that are encountered during the performance of the Work that require relocation or are damaged with new materials equal in quality and type to the materials encountered.

B. Installation of new materials will be as specified in the Contract Documents or in accordance with the agency having jurisdiction. Bedding and backfill material, unless otherwise specified, will be Class II granular material, compacted to 95% of its maximum unit weight, and approved by the Landscape Architect.

C. Seepage bed tile and water mains will be replaced in accordance with the requirement of the agency having jurisdiction.

D. The relocation or protection of existing sewers, tiles, tile field, water mains or building services and leads will be at the Contractor's expense, unless otherwise indicated in the Contract Documents.

3.7 EXISTING STRUCTURES

A. Existing surface and subsurface structures may be shown on the Plans, in locations considered most probable from information secured in the field investigation or from available public records.

B. Neither the correctness nor completeness of such information is guaranteed or implied.

C. Structures will be protected, preserved or restored by the Contractor, to the satisfaction of the structure owner, at no additional cost to the Project.

3.8 EXISTING BUILDINGS

A. Existing buildings or structures may be encountered throughout the Project within limits of the presently established right-of-way or easement. Good construction methods and procedures will be employed by the Contractor, at Contractor's expense, to protect the structures.

B. When it becomes necessary for the Contractor to move one of these buildings or structures in order to proceed with construction, the Contractor, at Contractor's expense, will exercise all due care in moving the building or structure to prevent undue damage.

C. Prior to moving an existing building or structure, the Contractor will furnish the Landscape Architect with satisfactory evidence, in writing, that proper arrangements have been made with the owner.

D. Unless otherwise specified in the Contract Documents, the length of the move will be maintained to a minimum which will allow for construction of the improvement.

3.9 REMOVAL OF SEWERS AND CULVERTS

A. Unless otherwise specified in the Contract Documents, the Contractor, at Contractor's expense, will remove abandoned culvert, pipe, sewer, structure or part of a structure which is to be replaced or rendered useless by the new construction.

B. When a sewer or culvert is removed at a structure, the Contractor will install a masonry bulkhead in the structure.

C. Removal of a culvert or sewer also includes the removal and disposal of any end treatments or headwalls.

3.10 REMOVAL OF STRUCTURES

A. The removal of existing structures will consist of removing and salvaging the existing frame and cover by the Contractor. The ends of the existing pipe will be plugged and braced. The complete structure will be removed entirely and disposed of. The excavation will be backfilled with sand and compacted to 95% of its maximum unit weight. Maximum unit weight will be determined by ASTM D698, Method B.

B. If a structure is to be removed from a system that is to remain in service, a bypass system, approved by the Landscape Architect, will be installed and maintained by the Contractor, during the rebuilding period.

3.11 ABANDONING STRUCTURES

A. Demolish Break the structure down to at least 30 inches below the subgrade.

B. Pipes connected to the structure will be plugged with a brick, masonry or concrete bulkhead approved by the Landscape Architect.

C. Backfill the structure with flowable fill to 12 inches above the pipes and the remainder of the structure backfilled with sand-cement mixture at a 10 to 1 ratio to subgrade elevation or to 12 inches below finished grade.

D. Backfill the remainder of the excavation with a granular material, compacted to 95% of its unit weight, and will meet with the approval of the Landscape Architect. Maximum unit weight will be determined by ASTM D698, Method B.

3.12 SALVAGED MATERIAL

A. Salvaged materials will become the property of the Contractor unless otherwise specified in the Contract Documents, and will be disposed of by the Contractor, at Contractor's expense.

3.13 CROP DAMAGE

A. In areas where crops are encountered along the route of the construction, the Contractor will prepare a written agreement between the Contractor and the crop owner as to the type and nature of the crop that may be damaged during construction activities prior to the start of any construction activities within the area.

B. Contractor will be responsible for making full reimbursement to the owner of the crop damage on the basis of the following procedure:

1. The area of the crop damage will be determined by measurements taken by the Landscape Architect, and this area will include those portions of the crop which may extend into the public right-of-way.

2. The County Office of the U.S. Agricultural Extension Service will establish the average yield of the crop.

3. The cost of the crop will be determined by using the prevailing price at the time of harvest as furnished by the U.S. Agricultural Extension Service.

C. Contractor will furnish the Landscape Architect with satisfactory evidence that payment for crop damage was made, prior to receiving final payment on the Project.

3.14 REMOVE AND REPLACE TREE

A. Tree removal and replacement may be accomplished in two ways.

1. Contractor may completely remove and dispose of the existing trees, and after the new improvement has been completed, tested, accepted and rough grading has been completed, the Contractor will plant new trees, in approximately the same location as the existing trees, of size and species per the landscaping plans included in the Plans.

2. Contractor may remove and preserve the existing trees.

a. Trees will be properly cared for and maintained in a healthy condition.

b. After the new improvement has been installed, tested, accepted and rough grading completed, the trees wll be replanted in approximately the same location.

c. Any trees damaged, destroyed or which die, will be replaced at no additional cost.

B. Trees, whether replanted or planted new, will be guaranteed for a period of one year(s) from the date of Substantial Completion.

3.15 REMOVING PAVEMENT

A. Removal of concrete and bituminous pavement, as called for on the Plans, consists of removing and disposing of pavement and will include base courses, surface courses, integral and separate curbs, integral and separate curb and gutters, sidewalks and end headers.

B. Remove pavement to an existing joint or cut parallel to existing pavement joints.

C. Use a power-driven concrete saw, approved by the Landscape Architect, to make cuts. The depth of the saw cut will be a minimum of 6 inches to ensure that the removal of the old pavement will not disturb or damage the section of pavement remaining in place.

D. Residual concrete pavement will not be less than 5 feet measured transversely, nor less than 6 feet longitudinally measured from a joint.

E. In removing a concrete base course, where part of the existing bituminous surface is to remain in place, cut the full depth of the bituminous surface with a power-driven saw, approved by the Landscape Architect, along a line parallel to and at least 12 inches from either side of the base course removal.

F. Old pavement with a concrete cap will be considered as only one (1) pavement, whether or not there is a separation layer of earth, aggregate, or bituminous material between the old material and the concrete cap.

G. Removal of Curb for Curb Drop:

1. Where curb is to be removed for a curb drop, the operation will be performed either by saw cutting or by cold milling that has been approved by the Landscape Architect, so as to leave a neat surface with a maximum 1 inch lip, without damage to the underlying pavement.

H. Removal of Curb and Gutter:

1. Where curb and gutter are to be removed, the operation will be performed by saw cutting. The limits of the removal will be as shown on the Plans or as approved by the Landscape Architect. However, in no case will the width of removal be less than 18 inches for sections with rolled or straight curb or less than 24 inches for mountable curbs.

I. If during the pavement removal operation any concrete or bituminous pavement or surfacing is damaged beyond the removal limits designated, the damaged pavement or surfacing will be removed and replaced at the Contractor's expense.

J. Earth removed during the pavement removal operation will be replaced by backfilling to the proposed subgrade with a suitable material, approved by the Landscape Architect, at the Contractor's expense.

3.16 GUARDRAIL

A. Relocate or remove beam guardrail as specified on the Plans or as determined by the Landscape Architect. If the existing material is damaged or destroyed, the Contractor will replace the material at Contractor's expense.

B. Where guardrail is encountered during construction and is removed by the Contractor when its removal was not called for on the Plans, the guardrail will be replaced or restored, at the Contractor's expense, to a condition comparable to that prior to construction.

C. After the guardrail removal or relocation operations are complete, surplus material will be removed and disposed of by the Contractor, at Contractor's expense, unless otherwise called for in the Contract Documents.

D. Backfill holes or voids resulting from the guardrail removal operation with a Class II granular material that has been approved by the Landscape Architect.

3.17 FENCES

A. Remove and replace fences as indicated on the Plans. If any of the existing material is damaged or destroyed during the Contractor's activities, the Contractor will replace the damaged material at Contractor's expense.

B. Where fencing is encountered during construction and removed by the Contractor when its removal was not called for on the Plans, the fenceing will be replaced or restored, at the Contractor's expense, to a condition comparable to that prior to construction.

C. After the fence removal or relocation operations are complete, surplus material will be removed and disposed of by the Contractor, at Contractor's expense, unless otherwise called for in the Contract Documents.

D. Backfill holes or voids resulting from the fence removal operation with a suitable material that has been approved by the Landscape Architect.

E. Where fences are encountered that are being used to confine livestock or to provide security, the fence must be immediately replaced following construction. During construction, the Contractor, at Contractor's expense, must provide, install and maintain a temporary fence that has been approved by the Landscape Architect.

3.18 HOLES

A. Earth removed during any phase of the excavation or removal operations, resulting in a hole or void, will be replaced by backfilling to the proposed subgrade with a suitable granular material. The material will be placed by the controlled density method or other effective means having the approval of the Landscape Architect and will be compacted to 95% of maximum unit weight.

B. Furnishing, placing and compacting of the backfill material will be at the Contractor's expense.

3.19 RESTORATION IN RIGHT-OF-WAY AND YARD AREAS

A. Restore right-of-way and yard areas not paved or aggregate surfaced in accordance with the type and location specified herein, unless indicated otherwise on the Plans. Disturbed areas may be shaped by "Machine Grading" or another method approved by the Landscape Architect to achieve the cross section, line and grade shown on the Plans. Areas where slopes are 1 on 4 or flatter will be restored with topsoil, seed and mulch. Slopes steeper than 1 on 4 will be restored with sod.

B. Excess material from the restoration operation will be disposed of by the Contractor at Contractor's expense.

C. Grade disturbed areas to receive either topsoil and seed or topsoil and sod. Topsoil, seed, sod, fertilizer and mulch must conform to the requirements specified on the Plans and in Section 32 92 19 or 32 92 23.

D. Contractor, at Contractor's expense, will furnish, place, and compact any additional fill, meeting the approval of the Landscape Architect, needed to restore the disturbed areas to the cross sections called for on the Plans or as determined by the Landscape Architect.

3.20 RESTORATION OF AGGREGATE SURFACES

A. Shoulders:

1. Shoulders will be regarded as the area between the edge of pavement and the ditch, or the area within 10 feet of the pavement, whichever is the lesser.

2. Backfilling of trenches in the shoulder area will be carried to within 5 inches of the existing surface as specified under Trench “A" or Trench "B" of Section 31 23 33. Backfill the remaining depth with a minimum of 5 inches of compacted 22A or 23A aggregate with calcium chloride applied, at the rate of 6 pounds per ton of aggregate.

3. Contractor, at Contractor's expense, will furnish, place and compact materials necessary to complete the backfilling and restoration operation within the shoulder area.

B. Driveways and Parking Areas:

1. Aggregate driveway areas will be regarded as the area from the right-of-way line to the edge of the traveled roadway and will include the shoulder area.

2. Backfilling of trenches crossing aggregate surfaced driveways and parking areas will be carried to the bottom of the proposed base course as specified under Trench “B”. Backfill the remaining depth with a minimum of 6 inches of compacted 22A or 23A aggregate, with calcium chloride applied at the rate of 6 pounds per ton of aggregate.

3. Aggregate surfaced areas beyond the limits of the actual excavation which are disturbed, as determined by the Landscape Architect, by such operations as temporary storage of materials or passage of equipment, will be resurfaced, at the Contractor's expense.

a. The upper three 3 inches of disturbed areas will be removed as necessary to allow the final elevation of the resurfacing course to be at the elevation of the drive or parking area which existed prior to excavation.

b. Disturbed area will be resurfaced with a minimum of 3 inches of 22A or 23A compacted aggregate, with calcium chloride applied at the rate of of aggregate.

4. Contractor, at Contractor's expense, will furnish, place, and compact all materials necessary to complete the backfilling and restoration operations within the driveway and parking area.

C. Roads and Streets:

1. Backfilling of trenches crossing aggregate surfaced roads or streets will be carried to within 12 inches of the existing surface as specified under Trench "B" of Section 31 23 33 - Trenching and Backfilling. The remaining depth will be backfilled with two 6 inches layers of compacted 22A or 23A aggregate, with calcium chloride applied at the rate of 6 pounds per ton of aggregate.
2. Contractor, at Contractor's expense, will furnish, place, and compact materials necessary to complete the backfilling and restoration operations within the roadway or street area.
3. Settlement of the aggregate surface will be restored by placing additional aggregate, up to the original grade, and will be at the Contractor's expense.

D. Compaction

1. Compaction of aggregate will be performed by a pneumatic-tired roller or a vibratory compactor until the material forms a stable surface.

3.21 RESTORATION OF PAVED SURFACES

A. Contractor will furnish and provide the materials necessary to complete the backfilling and restoration operations, which includes furnishing, compacting, forming, placing, rolling, floating, jointing, finishing, curing and providing protection against elements.

B. Restoration of roadways that are partially damaged will include a minimum replacement of one (1), full width lane of roadway. The length of replacement will be at least equal to the width.

C. Concrete:

1. The backfilling of trenches crossing concrete driveways, sidewalks, roads, streets or parking areas will be carried to the bottom of the proposed pavement as specified under Trench "B" of Section 31 23 33 - Trenching and Backfilling.
2. Unless otherwise specified on the Plans or as determined by the Landscape Architect, concrete removed will be replaced with 3500 psi concrete of the thickness removed and will include reinforcing equal to the existing, if the existing pavement was reinforced.
3. Construction of concrete pavements will be in accordance with Section 31 23 33 - Trenching and Backfilling.
4. Restoration of sidewalks includes the construction of sidewalk ramps at the intersection of the curb and must conform to the current rules and regulations of the state of Michigan, and Section 32 13 15 - Sidewalks and Driveways. Unless otherwise indicated in the Proposal, this Work will be considered incidental to the Project.

D. Bituminous

1. The backfilling of trenches crossing bituminous driveways, sidewalks, roads, streets or parking areas will be carried to the bottom of the base course as specified under Trench "B" of Section 31 23 33 - Trenching and Backfilling.
2. Bituminous pavement or bituminous surface course with an aggregate base will be replaced in accordance with Section 32 12 16 - Bituminous Paving.
3. Bituminous surfaced areas beyond the limits of the actual excavation which are disturbed by such operations, as temporary storage of materials or passage of equipment, will be resurfaced with an approved bituminous mixture the same thickness as removed, but in no case less than 2 inches in thickness. Replacement material will extend to smooth-cut edges, be uniform in direction and at an elevation which provides a uniform surface between the undisturbed abutting surfaces.
4. Restoration of any bituminous chip seal shoulders that are damaged or partially damaged, as determined by the Landscape Architect, will include complete replacement full width and length (extending a minimum of 25 feet beyond the damaged area both ways). Existing bituminous chip seal shoulders will be brought to proper grade with compacted 22A or 23A aggregate and resurfaced with a double chip seal per Section 32 12 16 - Bituminous Paving.

3.22 SOIL EROSION AND SEDIMENTATION CONTROL

A. Contractor will comply with the requirements of Section 01 57 13. Prior to commencing any type of earthwork, the Contractor will obtain a Soil Erosion and Sedimentation Control permit from the local enforcing agency.

B. Contractor will obtain approvals, secure permits and post bonds and deposits required to comply with the Soil Erosion and Sedimentation Control Act, Part 91 of PA 451 of 1994, as amended, and those of the enforcing agency.

C. Contractor will provide the Landscape Architect with a copy of the soil erosion permit issued by the local enforcing agency for the Project, prior to commencing any type of earthwork on the Project.

3.23 EXCESS EXCAVATION

A. Excess excavation will be defined as surplus earth material realized from the construction that is free of brush, roots, stumps, broken concrete, pipe, debris, and other extraneous material.

B. Contractor, when requested by the Owner, will transport excess excavation to a site(s) designated by the Owner.

1. Excess excavation will be graded by the Contractor to provide positive surface drainage of the site(s).
2. Grading will be done such that adjacent properties are not damaged or affected. The grading will include removal of all surface irregularities to provide a smooth surface ±3 inches.

C. When the excess excavation has not been requested by the Owner, the Contractor will remove and properly dispose of the material at no additional cost to the Owner.

D. Proper disposal of all excess excavation, including transportation, grading, and protection of adjacent properties will be considered as a final cleanup item. No additional payment will be made for this item.

E. Brush, roots, stumps, broken concrete, pipe, debris, and other extraneous material from the construction will become the property of the Contractor, and will be disposed of per all applicable Laws, rules or regulations. Removal and disposal of this material will be considered as part of final cleanup. No additional payment will be made for this item.

F. Owner approval of the final site(s) condition in writing will be required prior to final payment authorization.

END OF SECTION

SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.1 SCOPE OF WORK

A. The Work of this Section includes, but is not limited to, demolition of and disposal of building materials, concrete and included reinforcement, brick or tile masonry, wood and metal framing, mechanical and electrical components, plumbing components, structural elements and appurtenances from structures and facilities as listed in this Section and/or identified on the Drawings which are required to be removed as necessary where encountered within the limits of excavation or as directed by the Owner.

B. Coordinate with the agencies having jurisdiction with regard to requirements and permits.

C. Notify Owner and adjacent neighbors of the date and time of the demolition at least 24 hours prior to commencing work.

D. Perform demolition work hours Monday through Friday between 7:00 AM and 6:00 PM. Do not start a demolition that cannot be completed in one day on a Friday. Do not leave a partially demolished site unattended over the weekend.

E. Secure necessary permits including, but not limited to: Building Permit to Demolish, Sewer Permit, Hydrant Permit, and _____. Permits are the Contractor's responsibility unless otherwise noted.

F. Coordinate work performed to have utilities shut off for project location. Ensure there is no loss of utilities to surrounding properties.

G. Notify MISS DIG prior to beginning work.

H. Prior to demolition, walk through interior of structure to verify it is unoccupied and to confirm that utilities have been properly disconnected.

I. Take necessary precautions to protect workers and the public, including but not limited to, warning signs, barricades, and fall protection. Eliminate unnecessary hazards before leaving the jobsite at the end of each day. Hazards such as missing sidewalks and demolition debris must be enclosed with yellow caution tape.

J. Reinstall fall protection and safety precautions at the end of each workday.

K. In the event of accidental damage to an adjacent property, speak with the property owner and notify Owner immediately. Contractor is liable for damage to neighboring property.

L. Provide to Owner prior to, and as an additional condition of, payment for work performed the following documentation:

1. Pertinent verified original receipts from an approved land fill or dump site, evidencing that waste material from the job site contracted herein was disposed of in a proper manner.

a. Receipts must bear the date, job address, location of land fill or dumpsite, cubic yardage dumped, and bear the signature of the Contractor's driver and receiving facility representative.

b. In the event such land fill receipts are not provided, payment will be withheld until it is received and approved thereof.

M. Minimize noise, dust and inconvenience to neighbors. Provide labor and use hoses of sufficient length (minimum 100 lineal feet) to prevent the discharge of visible dust emissions to the outside air throughout demolition.

N. Restore property as required herein and as shown on the Drawings.

O. Property dimensions and quantities must be field verified.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 31 23 16 - Structural Excavation and Backfill

1.3 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; Current Edition

B. NFPA 241 - Standards for Safeguarding Construction, Alteration, and Demolition Operations; 2013 Edition

1.4 QUALITY ASSURANCE AND QUALITY CONTROL

A. Adhere to and disposal of all demolition materials in accordance with the requirements of applicable ordinances, codes, statutory rules and regulations of federal, state and local authorities.

B. Protect persons and property throughout progress of work. Proceed in such manner as to minimize spread of dust and flying particles and to provide safe working conditions for personnel. Take the necessary precautions to capture all particles and construction debris within the site limits.

C. Maintain circulation of traffic within area at all times during demolition operations.

D. Obtain permission from the Owner before abandoning or removing any existing structures, materials, equipment and appurtenances.

E. Make necessary arrangements with and perform work required by utility companies and municipal departments for discontinuance or interruption of utility services due to demolition work.

F. Contractor's Superintendent must be on site when demolition work is taking place.

1.5 SUBMITTALS

A. Demolition Plan:

1. Submit to the Owner for review, a Demolition Plan describing proposed sequence, methods, and equipment for demolition and disposal of each structure.

2. Pre-Demolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces, which might be

misconstrued as damage caused by building demolition operations using pre-demolition photographs and pre-demolition video.

3. Methods of demolition and equipment proposed to demolish each structure.
4. Copies of any authorizations and permits to perform work.
5. Submit documentation confirming acceptance by landfill(s) or other disposal facilities of demolition materials.
6. Accurately record actual locations of capped and active utilities and subsurface construction.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 DEMOLITION - GENERAL

A. Wet down work during demolition operations to prevent dust from arising.

B. For structures identified for demolition on the drawings, completely remove the foundation below ground surface as well as basement walls in their entirety, and fill to level of adjacent ground with suitable material and compact in a manner that complies with requirements stated elsewhere in the Specifications, particularly Section 31 23 16 - Structural Excavation and Backfill.

C. Remove existing work as indicated and as required to accomplish new work.

1. Remove items indicated on the Drawings. Where piping or electrical lines are removed back to a functioning point, cut/cap/properly terminate the remaining functioning component.
2. When pipes, conduits other equipment are removed, fasteners for that equipment will also be removed and all holes/damage to the existing structures from which the equipment was attached will be filled and repaired with like materials.

D. Remove existing mechanical/electrical s(e.g., Process equipment, HVAC, Plumbing, Fire Protection, Electrical, Telecommunications, etc.) Remove existing systems and equipment as indicated:

1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
3. Verify that abandoned services serve only abandoned facilities before removal.
4. When a piece of equipment is shown to be removed, the power feed to that piece of equipment including conduit/wire/starter must also be removed unless otherwise directed by Landscape Architect.
5. Remove piping interconnecting pieces of equipment and/or associated with the system(s) to be removed even if not specifically shown to be removed on the Drawings. Remove pipe supports associated with the removed piping.

6. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.
7. Remove concrete equipment bases for equipment to be removed to the building foundation/floor. Patch existing floor smooth with non-shrink grout or suitable epoxy finish for sure
8. Where vents or other pipes/conduits that are to be removed pass through an existing roof/floor/wall that is to remain, the resulting hole in the roof/floor/wall are to be patched and made watertight to match the existing materials.
9. Remove existing electrical equipment and fixtures with such care as may be required to prevent unnecessary damage, to keep existing systems in operation, to allow for relocation where shown, and to maintain the integrity of the grounding systems.
10. Abandon conduits and wires where shown on the Drawings. Disassemble and dispose of exposed conduits and their supports.
    a. Remove and dispose of wires in abandoned conduits.
    b. Cut flush with the slab or wall at the point of entrance of conduits concealed in floor or ceiling slabs or in walls. Plug the area repaired in a flush, smooth and approved manner.

E. Protect existing work to remain:
1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work; patch as specified.

F. Building/Structure Demolition:
1. Demolish concrete and masonry in small sections.
2. Wherever possible, sawcut materials to be removed. Where jackhammering or other destructive means are required, protect existing remaining equipment/structures.
3. Remove structural framing members and lower to ground by means of hoists, derricks, or other suitable methods.
4. Remove structures to the lines and grades shown unless otherwise directed by the Landscape Architect. Where no limits are shown, the limits will be 4-inch outside the item to be installed. The removal of masonry beyond these limits will be at the Contractor’s expense and these excess removals will be reconstructed to the satisfaction of the Landscape Architect with no additional compensation to the Contractor.
5. After removal of parts of walls, slabs and like work which tie into new work or existing work, the point of junction must be neatly repaired so as to leave only finished edges and surface exposed.

3.2 DEMOLITION OF BUILDINGS

A. Demolish structure(s) and ancillary improvements on property such as garages and sheds; and paved surfaces including driveways, service walks and patios, unless otherwise noted. Haul debris to an appropriate landfill. Structural elements, including basement walls and floor, are to be removed unless otherwise noted.

B. Foundation:

1. Remove all portions of foundation unless needed to support an existing driveway, sidewalk, adjacent structure, or utility.

    a. If portions of the foundation are left to support an existing driveway, sidewalk, adjacent structure, or utility, the foundation should be removed to at least 18 inches below finished grade.

C. Existing Pavement Conditions:

1. Remove apron and install lawn. Curbs at the site will be replaced in-kind. Retain City sidewalk in its current location unless a repair is specified. Damage to public sidewalks, curbs and streets must be corrected or repaired pursuant to the City's regulations.

2. Remove foundation plantings and front yard hedges unless otherwise noted. Preserve mature trees. Do not use mechanical equipment to dig under the drip line of the trees to be preserved.

D. After the removal of the building materials and structural elements:

1. Obtain a clean hole inspection and approval from the local municipality.

2. Backfill site with approved clean fill material. Compacted in lifts sufficient to prevent uneven settlement in accordance with Specification Section 31 23 16 - Structural Excavation and Backfill.

E. Provide a finished site that is level and free of construction debris, brush and trash, including along lot lines and tree lawn.

1. Contractor is responsible for completing site finish as specified in paragraph 3.02.G herein, and for ensuring that grass is growing onsite and that the site can be safely mowed.

F. Fence Notes:

1. Remove fence segments attached to structure and freestanding fences.

G. Site Finish and Grass (applies to disturbed areas unless otherwise noted):

1. Restore site as noted on the Drawings or in accordance with Section(s) 32 90 00 - Plantings, 32 92 19 - Seeding, and 32 92 23 - Sodding.

3.3 DEMOLITION OF STRUCTURES OR SEWERS

A. Dispose of demolition debris using methods and in approved locations as required by applicable laws and regulations based on the debris characterization and testing results.

B. Erect and maintain fences, warning signs, barricades, and other devices around the reconstruction as required for the protection of the public, Contractor 's employees, and Owner 's personnel. Remove all such protection when reconstruction activities are complete, as work progresses, or when directed by the Landscape Architect.

C. Preparation:

1. Notify Owner of appropriate utilities to turn off affected services before starting demolition or alterations at new structure and at existing buildings to be demolished.
2. Remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction before starting demolition.
3. Locate, identify, disconnect, and seal or cap off indicated utilities serving structures to be demolished.

D. Demolition Requirements:

1. Use mechanical means to accomplish demolition. The use of explosives is not allowed.
2. Perform each demolition to minimize noise and dust contamination and in accordance with local and state regulations.
3. Do not utilize demolition; transport and dispose of demolition debris offsite to an approved disposal area or facility.
4. After demolition is complete and the demolition debris has been removed, backfill the site with specified material utilizing compaction techniques approved by the Owner and Landscape Architect in accordance with Section 31 23 16 - Structural Excavation and Backfill.
5. Utility services running to existing buildings that are to be demolished will be abandoned per requirements of appropriate utility company.

E. Take precautions to avoid damage to adjacent facilities and to limit the work activities to the extent indicated. If reconstruction beyond the scope indicated is required, obtain approval from the Owner prior to commencing Work.

F. Perform demolition and removal Work to prevent damage or injury to structures, occupants thereof and adjacent features which might result from falling debris or other causes, and so as not to interfere with the use, and free and safe passage to and from adjacent structures.

G. Closing or obstructing of roadways, sidewalks, and passageways adjacent to the Work by the placement or storage of materials will not be permitted; conduct construction operations with a minimum interference to the public or Owner.

H. Erect and maintain barriers, lights, sidewalk sheds, and other necessary protective devices.

I. Repair damage to facilities to remain, or to any property belonging to the Owner or occupants of the facilities.

3.4 BACKFILLING

A. Do not use demolition debris as backfill material.

B. Below-Grade Areas: Completely fill below grade areas and voids resulting from building demolition operations with granular backfill according to backfill requirements in Section 31 23 16 - Structural Excavation and Backfill.

C. Backfill demolished areas to existing ground level or foundation level of new construction as specified elsewhere in the Contract Documents.

3.5 DISPOSAL

A. Dispose of reinforced concrete, masonry, contained steel or castings and other materials which are removed at an approved offsite location.

B. Dispose of debris and other non-salvaged materials offsite in licensed landfills that are deemed appropriate for the types of debris to be disposed.

C. Materials, equipment, and appurtenances removed, that are not designated for relocation, become property of Contractor. Haul from site and dispose of according to local, state and federal regulations.

3.6 RESTORATION

A. Restore surface of areas affected by building demolition to match adjacent conditions or meet local codes, whichever is more stringent.

END OF SECTION

SECTION 02 41 13
SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Contractor will furnish labor, materials and equipment necessary for the removal and subsequent disposal of the area(s) slated for demolition, including but not limited to supports, piping, electrical equipment, mechanical equipment, floors, walls, ceilings, doors, windows, wood or metal framing, masonry, and asphalt paving, as shown on the Contract Drawings and specified herein. In addition, various utilities will be cut, abandoned and capped, or completely removed; miscellaneous clearing and grubbing of trees, brush, and vegetation at boundary area will be performed.

1. Work includes the removal and disposal of the building materials and debris including the removal and disposal of miscellaneous site debris, including but not limited to building area debris, woods, piping materials, bricks, roof materials, metal equipment and all other non-specified material and debris found at the site.

2. Work includes the removal and disposal of the building debris and concrete materials generated by the demolition of the structures listed above. Removal and disposal of concrete, rebar, and steel is incidental to the project. It is recommended that steel be recycled. Contractor may recycle concrete and asphalt to reduce cost.

B. Contractor has salvage rights to all salvageable restaurant equipment, electrical equipment, metals, salable items, and other recyclable materials unless indicated otherwise.

1. Do not salvage contaminated building materials; materials may be disposed of in accordance with applicable local, state, and federal regulations.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 33 00 - Submittal Procedures

B. Section 01 31 19 - Project Meetings

C. Section 01 77 00 - Closeout Procedures

D. Section 31 23 16 - Structural Excavation and Backfill

1.3 DEFINITIONS

A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner’s property.

B. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner’s property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to the Owner’s designated storage area.

C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.

D. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Owner, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.4 PERMITS

A. Permits described here cover the general description of the permits called for demolition. The permits described below are not necessarily all of the permits required for completion of this project.

1. Demolition Permit - Contractor is responsible for obtaining a demolition permit from the Building Department. Contractor is responsible for all permit fees.

2. NESHAP Notification of Intent to Demolish - Contractor is responsible for filing and for the fee involved with submitting an intent to demolish permit from the Michigan Department of Environment, Great Lakes and Energy, Air Quality Division.

a. The notification is describe the demolition tasks to be conducted and the quantities of asbestos containing materials specified for abatement.

3. Soil Erosion and Sedimentation Control - Contractor is responsible for filing and for the fee involved with obtaining soil erosion and sedimentation control permits from the agency having jurisdiction.

1.5 MATERIAL OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner’s property, demolished materials will become the Contractor’s property and are to be removed from the site with further legal disposition legally at Contractor’s option.

1.6 SUBMITTALS

A. Submit each of the following items in accordance with Section 01 33 00:

1. Work Plan: Prior to proceeding with the demolition, removal and disposal work, submit a work plan which includes the means, methods and procedures proposed for the accomplishment of the removal and disposal work.

a. Provide means, methods and procedures for safe conduct of the work; careful removal and disposition of buildings and structures, and solid materials and wastes; and protection of property that is to remain undisturbed.

b. Provide a detailed description of the methods and equipment to be used for each operation, including a sequence of operations.

c. Submit the name and location of disposal facilities for all removed materials in the Work Plan.

d. Based the Work Plan on work experience and the guidance provided in this specification. The cost of work plan preparation is incidental to the project.

2. Demolition Schedule: Submit a complete coordination schedule for demolition work, including shut-off and continuation of utility services, with the Landscape Architect's approval prior to start of the work.
    a. Contractor's schedule will indicate proposed methods and operations of facility demolition, and provide a detailed sequence of demolition and removal work to ensure uninterrupted operation of occupied areas.
3. Disposal Documents: Provide copies of all licenses, certifications, permits, agreements, manifests, chain of custody records, weigh tickets, meter recordings, delivery tickets, and receipts required or issued for the disposal of materials, the methods used, and the disposal areas and facilities. Provide a copy of the results of tests performed to comply with the requirements of each disposal facility.
4. Manifests: Submit a copy of the official manifest for each shipment of removed materials including, but not limited to, building and structure debris, concrete and brick debris, and miscellaneous site debris and solid wastes evidencing delivery of the material to an approved licensed disposal facility. Manifests will be in accordance with the requirements of all the applicable federal, state and local regulations, and will be signed by the Owner or the Owner's designated Representative.
5. Project Record Documents: Accurately record actual locations of capped utilities, concealed utilities discovered during demolition, and subsurface obstructions in accordance with Section 01 77 00.

1.7 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed selective demolition Work similar to that indicated for this Project.

B. Regulatory Requirements: Comply with governing Environmental Protection Agency notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Pre-Demolition Conference: Conduct conference at Project site to comply with Section 01 31 19.

1.8 PROJECT/SITE CONDITIONS

A. Condition of Facilities: Owner assumes no responsibility for actual condition of facilities to be demolished.

B. Occupancy: Owner may continuously occupy areas of site immediately adjacent to areas of selective demolition. Conduct demolition work in manner that will minimize need for disruption of the Owner’s normal operations.

C. Protections: Provide temporary barricades and other forms of protection to protect the public from injury due to selective demolition work.

1. Provide protective measures as required to provide free and safe passage of the Owner, tenants, vehicles, and general public to areas directly affected by demolition activities and those adjacent to such activities.

2. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished and adjacent facilities or work to remain.
3. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.
4. Protect floors with suitable coverings when necessary.
5. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing structures.
6. Provide temporary dust and debris barriers of fire resistant materials to control dust and debris and to confine demolition of existing and finished work.
7. Remove protections at completion of work.

D. Damages: Promptly repair damages caused to adjacent facilities by demolition work.

E. Traffic: Conduct selective demolition operations and debris removal to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

1. Do not close, block, or otherwise obstruct streets, walks, or other occupied or used facilities without approval from the Owner and providing alternate routes around closed or obstructed traffic ways.

F. Flame Cutting: Do not use cutting torches for removal until work area is cleared of flammable materials. At concealed spaces, such as interior of pipe spaces, verify condition of hidden space before starting flame-cutting operations. Maintain portable fire suppression devices during flame-cutting operations.

G. Explosives: Use of explosives is not permitted.

H. Utility Services: Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.

1. General:

a. Do not interrupt utilities serving occupied or used facilities, except when authorized in writing by the Owner. Provide temporary services during interruptions to existing utilities or schedule work to install interrupted utilities first, as acceptable to the Owner.

b. Maintain fire protection services during selective demolition operations.

c. Provide temporary support and protection of existing utilities, which cross the proposed piping trench.

d. Permits must be obtained from utility or agency having jurisdiction, if necessary. Contractor is responsible for all permit fees.

e. If relocation of any utility is necessary, the Contractor is responsible for associated fees or expenses, unless indicated otherwise.

2. Electrical Disconnection: Verify that onsite electrical wiring entering all structures to be demolished, or in close enough proximity to be damaged by the demolition operations, have been disconnected and/or de-energized prior to proceeding with demolition operations.
    a. Coordinate with the local electrical utility company for any necessary relocation of utilities and be responsible for any associated fees or expenses.
3. Water Disconnection: Perform or verify that on-site water lines entering all structures or in close enough proximity to be damaged by the demolition operations have been disconnected and/or capped prior to proceeding with demolition operations.
4. Sewer Disconnection: Locate and bulkhead all sewer connections from the building structure prior to proceeding to demolition.
5. Gas Disconnection: Verify that on-site gas lines/mains entering all structures or in close enough proximity to be damaged as a result of the demolition operations have been disconnected and/or capped prior to proceeding with demolition operations.
6. Telephone and Cable Disconnection: Verify that on-site gas lines/mains entering all structures or in close enough proximity to be damaged as a result of the demolition operations have been disconnected and/or capped prior to proceeding with demolition operations.

I. Environmental Controls: Use water sprinkling, temporary enclosures, and other methods to limit dust and dirt migration. Comply with governing regulations pertaining to environmental protection.
    1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

J. Provide ventilation to maintain non-toxic unpolluted working area for adjacent the Owner's operating areas and construction/demolition areas. Welding and cutting torches producing smoke or toxic fumes must be adequately ventilated.

1.9 WARRANTY

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

PART 2 PRODUCTS

2.1 REPAIR MATERIALS

A. Use repair materials identical to existing materials.
    1. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
    2. Use materials whose installed performance equals or surpasses that of existing materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Provide written pre-demolition report to the Landscape Architect prior to start of Work. The report will contain the following information at a mini:

1. Determination of condition of framing, floors, and walls, and possibility of unplanned collapse of any portion of structure or adjacent structure where employees may be exposed.

2. Various phases of demolition and description of how employees will be protected from unplanned contact with active utilities, exposure to toxic materials and gases, falling objects, structural collapse, and any other hazards routinely associated with demolition activities.

B. Locate existing utilities within project limits prior to any demolition. Verify that utilities have been disconnected and capped.

1. If unanticipated mechanical, electrical or structural elements that conflict with intended function or design are encountered, investigate and measure nature and extent of conflict and promptly submit a written report to the Landscape Architect.

a. Pending review of the report by the Landscape Architect, the Contractor will rearrange the selective demolition schedule, and notify the Landscape Architect and the Owner as necessary to continue overall job progress without delay.

3.2 PREPARATION

A. Conduct demolition operations and remove debris in manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

B. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities designated to remain.

1. Provide temporary barricades and other forms of protection as required for safety and security.

2. Provide barriers and appropriate to restrict pedestrians from wandering into construction areas.

3. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure no water leakage or damage occurs to structure or interior areas.

C. Erect and maintain dust-proof partitions and temporary enclosures to limit dust or dust migration, and to separate areas from fumes and noise, if necessary.

D. Provide and maintain interior and exterior shoring, bracing or structural support to preserve stability and prevent movement, settlement, or collapse of structures and adjacent facilities that are not part of demolition.

E. Provide acceptable temporary security barriers where physical security of buildings or fences is compromised due to demolition work.

3.3 SALVAGE REQUIREMENTS

A. Coordinate with the Owner to identify structure and/or building components and equipment required to be removed and delivered to the Owner subsequent to demolition.

1. Owner will tag components and equipment designated for salvage.

B. Protect designated salvage items from demolition operations until items can be removed.

1. Carefully remove components and equipment indicated to be salvaged.
2. Disassemble as required to permit removal .
3. Package small and loose parts to avoid loss.
4. Mark equipment and packaged parts to permit identification and consolidation of components of each salvaged item.
5. Deliver salvaged items to the Owner and obtain signed receipt from the Ownerindicating that the Owner has received tagged items.

3.4 SELECTIVE DEMOLITION

A. General:

1. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete Work within limitations of governing regulations and as follows:
   a. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
   b. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.
2. Perform work in safe and systematic manner.
3. Use such methods as required to complete work indicated on Contract Drawings and minimize disturbance of the Owner’s normal operations.
4. Use water as necessary to lay dust when chipping, coring, or sawing concrete, masonry or similar materials. Water must be controlled inside buildings by damming, mopping or vacuuming. Prevent water from entering underfloor electrical ducts.
5. Completely backfill below-grade areas and voids resulting from utility removal and other demolition work.
6. Remove debris from roof or other above-grade location through enclosed chute or bundle, and lower by hand or with hoisting device.
7. Equipment Removal:
   a. When a piece of equipment is to be removed, ancillary items associated with that equipment are to be removed by the Contractor, unless specifically called out or shown to remain, including but not limited to the following: electrical

feed, conduit, wiring, motor starter, concrete base or supports, as well as service piping (e.g., water, gas, propane, etc.) and supports.

b. Surfaces will be repaired or patched after removing the equipment and ancillary items.

c. Contractor to field verify the extent of the designated equipment and its ancillary items during the bidding process as the equipment and ancillary items may not be completely shown on the Contract Drawings, as accurate records may not exist.

d. The cost to remove ancillary items and repair/patch surfaces will be considered incidental to the Contract unless otherwise specified.

B. Structure Demolition:

1. Demolish building structures and appurtenances as shown and required to complete work within limitations of governing regulations.

2. Small structures may be removed intact when acceptable to the Landscape Architect and approved by authorities having jurisdiction.

3. Proceed with demolition in a systematic manner, in accordance with permits and approved submittals.

4. Demolish concrete and masonry in sections. Use bracing and shoring to prevent collapse.

5. Disperse demolition equipment throughout the structure. Remove demolished materials to prevent excessive loads on supporting walls, floors or framing.

6. In areas to be remodeled, cut back flush and seal any pipe stub-outs remaining, and remove exposed piping, conduits, fixtures, J boxes, light fixtures, water fixtures, and supports. Remove switches, receptacles, and boxes. Remove or cap and abandoned concealed piping and conduits as necessary to facilitate the remodeling work. Remove other items as shown on the Plans.

C. Below-Grade Demolition:

1. Demolish and remove footings, foundation walls, below-grade construction and concrete slabs on grade.

a. In areas where new construction will take place, remove to a depth which will not interfere with new construction, but not less than 12 inches below existing ground surface or future ground surface, whichever is lower or as indicated on the plans.

2. Fill below-grade areas and voids resulting from demolition of structures completely.

3. Fill and compaction will be in accordance with Section 31 23 16.

4. After fill and compaction, grade surfaces to meet adjacent contours and to provide flow to surface drainage structures, or as shown.

3.5 REPAIRS

A. Provide patching, replacing, repairing, and refinishing of damaged areas involved in demolition as necessary to match the existing adjacent surfaces whether shown or not shown, with materials and procedures approved by the Landscape Architect.

B. Return structures and surfaces not part of demolition, to conditions existing prior to commencement of demolition work.

C. Repair damages caused to adjacent facilities by demolition activities, as directed by the Landscape Architect and at no cost to the Owner.

D. Conduct a detailed inspection after patching and repairing has been completed in the presence of the Owner and Landscape Architect. Carefully remove splattering of mortar from adjoining work (particularly, but not limited to, plumbing fixtures, trim, tile, and finish metal surfaces), and make good any damage caused by such cleaning operations.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove and legally dispose of demolished materials, site debris, rubbish, and other materials resulting from demolition operations promptly removed.

1. Conduct demolition and removal of debris in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities will not be closed or obstructed without prior permission from the Owner.

2. If the Contractor encounters material during removal that is suspected to be potential hazard, stop work immediately and notify the Landscape Architect.

3. Disposal must conform to Federal, State and local requirements.

4. Removed materials will be documented by manifests and disposal facility tickets with copies given to the Landscape Architect 48 hours after removal from the site.

B. Burning of removed materials from demolished structures is not permitted onsite.

3.7 RECYCLING

A. Owner encourages the recycling of demolition debris where appropriate. Contractor has the option to recycle any material found or demolished on site in order to reduce costs or project duration.

B. Although the materials are not limited, it is recommended that at least steel and concrete be recycled.

1. Steel and concrete to be recycled can be stockpiled on site and eventually removed. Steel separated from demolition rubble may be recycled and becomes the property of the Contractor.

2. Contractor will not be allowed to abate on site any lead paint found on the steel unless appropriate procedures and federal, state and local codes or regulations are followed.

3. Remove any material stockpiled for recycling from the site prior to the contract end date and/or site restoration.

3.8 CLEANING

A. During and upon completion of work, promptly remove unused tools and equipment, surplus materials, rubbish, debris, and dust and leave areas affected by work in a clean, approved condition in Division 01.

B. Clean adjacent structures and facilities of dust, dirt, and debris caused by demolition, as directed by the Landscape Architect or Owner, and return adjacent areas to condition existing prior to start of work.

END OF SECTION

SECTION 03 11 00
CONCRETE FORMING

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section includes formwork for cast-in-place concrete, complete with furnishing, preparation, installation, coating, protection, adjustment, removal and accessories.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 15 00 - Concrete Accessories

B. Section 03 20 00 - Concrete Reinforcing

C. Section 03 30 00 - Cast-in-Place Concrete

1.3 DESIGN STANDARDS

A. The formwork will be designed for the loads, lateral pressure, and allowable stresses outlined in ACI 347R - Guide to Formwork for Concrete, and for design considerations, wind loads, allowable stresses and other applicable requirements of the local building code. The design and construction of the formwork will be the responsibility of the Contractor.

B. The formwork will be true in every respect to produce hardened concrete to the required shape, size, grade and alignment as indicated on the Plan, and of sufficient strength, bracing and rigidity to maintain their position and shape under the loads and operations incidental to placing and curing the concrete, as well as all other forces resulting from the movement of the forms.

C. The forms will be mortar-tight at the time concrete is placed in them and will be so constructed that the surfaces of the finished concrete will be reasonably free from ridges, fins, offsets, or similar defects.

D. Adequate and suitable means for removing the forms without injury to the surfaces or edges of the finished concrete will be provided.

1.4 ALLOWABLE TOLERANCES

A. Formwork will be constructed such that the hardened surfaces will conform to the tolerance limits of ACI 347R, except as modified below:

1. Variation from plumb in lines and surfaces of piers, walls, or columns
    a. In any 10 feet of length:1/4 inch
    b. Maximum for entire length: 1 inch
2. Variation from the level or from the grades
    a. In any 10 feet of length: 1/4 inch
    b. Maximum for entire length: 3/4 inch
3. Variation of distance between walls, columns and beams
    a. In any 10 feet of distance: 1/4 inch

b. Maximum for entire distance: 1 inch

4. Variation of the linear lines from established position as indicated on the Plan
   a. In any 20 feet (6 m) of length: 1/2 inch
   b. Maximum for entire length: 1 inch
5. Variation in sizes and locations of sleeves, floor openings, and wall openings
   a. Minus: 1/4 inch
   b. Plus: 1/2 inch
6. Variation in cross-sectional dimensions of columns and beams and thickness of slabs and walls
   a. Minus: 1/4 inch
   b. Plus: 1/2 inch
7. Variations of footing dimensions from plan dimensions
   a. Minus: 1/2 inch
   b. Plus: 2 inch
8. Thickness ± 5%, up to maximum of 1 inch

1.5 REFERENCE STANDARDS

A. ACI 347R - Guide to Formwork for Concrete

B. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field

1.6 SUBMITTALS

A. Submit manufacturer's literature for form coating.

B. Submit formwork layout plans, design data and procedures if requested by the Landscape Architect.

1.7 STORAGE AND HANDLING

A. Store and handle form coating to prevent contamination of coating in accordance with manufacturer's recommendations.

1.8 SEQUENCING

A. Sequence installation of formwork with the Work of Section 03 20 00, Section 03 15 00, and Section 03 30 00.

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Use lumber that is straight, uniform width and thickness, free from knots, offsets, holes, dents, warpage and other surface defects.

B. Use plywood product of standard psi, waterproof, resin-bonded, exterior-type Douglas Fir, face adjacent to concrete will be Grade B or better.

C. Metal forms to be smooth metal plate free of surface irregularities.

D. Chamfer Strips: Use clear white pine, surface against concrete planed, 1 inch bevel width or cant strip.

2.2 FORM COATING

A. Utilize nonstaining form oil or alternative mineral oils that will not discolor or adversely affect the concrete.

2.3 FORM TIES

A. Use permanently embedded body type with removable end cones on outer ends, permanently embedded portion 1 inch back from concrete face.

2.4 FORMS - GENERAL

A. Use forms that conform to ACI 347R. Fabricate with facing materials that produce the specified tolerance requirements outlined in Part 1 of this Section; produce true surfaces, sharp corners and true lines; and are free of offsets, ridges, bulging, waves and concave or convex areas.

2.5 LAYOUT

A. Use regular and uniform pattern; long dimension of panels vertical; joints horizontal, vertical and aligned; form ties uniformly spaced and aligned in horizontal and vertical rows.

PART 3 EXECUTION

3.1 PREPARATION

A. Do not reuse forms if there is any evidence of surface wear and tear or defects which would impair the quality of the surface. Clean surfaces of forms and embedded of any mortar from previous concreting and of other foreign material or water before coating is placed in them.

B. Coat forms in accordance with manufacturer's recommendations before the form or reinforcement is placed in final position. Remove surplus coating on form surfaces, or any coating on reinforcing steel and construction joints before placing concrete.

3.2 INSTALLATION OF FORMS

A. Forms must be sufficiently tight to prevent loss of mortar from the concrete, set true to the lines and elevations indicated on the Plans, tied and braced to remain true during and after concrete placement within tolerances outlined in Part 1 of this Section. Landscape Architect may at any time condemn any section or sections of forms found deficient in any respect, and such form will be promptly removed and replaced.

B. Wooden spreaders will not be allowed to remain in the concrete. No metal will be within 1 inch of any surface.

C. Place chamfer strips in forms to bevel all corners, edges, joints and other structural elements exposed to view, including use of dummy chamfer and false joints to provide neat and uniform appearance. Exposed corners and edges will have 3/4 by 3/4 inch - 45 degree chamfers, unless otherwise indicated on the Plans.

D. Provide temporary openings at the base of wall forms and at the other points when necessary to facilitate cleaning and inspection immediately before depositing concrete.

E. Secure in position wedges used for final alignment and items to be embedded in concrete.

F. Prepare forms for keyways in advance of pouring concrete. Rigidly secure keyway forms in slab edges and vertical wall joints in place before the concrete is poured. Forms for keyways for horizontal joints in walls may be placed at the conclusion of the pour, but proper provision must be made for obtaining and holding the full depth and form of the keyway.

3.3 ADJUSTMENT OF FORMS

A. Positive means of adjustment should be provided to permit realignment or readjustment of shores if excessive settlement occurs.

B. A pair of wedges may be used at the top or bottom of shores, but not at both ends, to facilitate vertical adjustment, to correct uneven settlements, or to facilitate dismantling of the formwork.

C. Screw jacks for pipe shores or scaffold-type shoring may be used at both top and bottom so long as they are secured by the shore or scaffold leg against loosening or falling out, to avoid lateral deflections.

D. Check, during and after concreting, but before initial set of the concrete, the elevations, camber, and plumbness of formwork systems using telltale devices. Make appropriate adjustments promptly where necessary. If, during construction, any weakness develops and the formwork shows any undue settlement or distortion, the Work must be stopped, the affected construction removed if permanently damaged, and the formwork strengthened.

3.4 REMOVAL OF FORMS

A. Do not remove or disturb forms, wedges or shoring until the concrete has attained sufficient strength to safely support all superimposed dead, temporary construction, and live loads. When forms or shoring are removed, no excessive deflection or distortion of the concrete is permitted. Remove forms in an orderly fashion to avoid surface gouging, corner or edge breakage, or other damage or injury to the concrete surface or physical property; and without impact or shock, to permit the concrete to carry its share of the loads gradually and uniformly. Do not impair the safety or serviceability of the structure or concrete members when removing forms.

B. Forms and shoring in the formwork used to support the weight of concrete in beams, slabs, and other structural members will remain in place a minimum of 14 days or until the concrete has reached a minimum of 75% of the design compressive strength. The cylinder strength will be based on test specimens cured in the field, as described in ASTM C31/C31M, under conditions which are not more favorable than the most unfavorable conditions for the portions of the concrete which the test specimens represent and will be determined in accordance with Section 03 30 00.

C. Formwork for columns, walls and other vertical members must remain in place a minimum of five (5) days or until the concrete has attained a minimum of 75% of its

design strength. Where such formwork also supports the formwork of beams and slabs, the removal times of the latter will govern. Remove face and edge forms as soon as practicable and permitted by the Landscape Architect in order to facilitate effective repair of voids or broken corners before the surface has dried.

D. Do not remove forms and shoring in the formwork without the approval of the Landscape Architect. The minimum in-place times are for ordinary conditions and represent cumulative number of days, not necessarily consecutive, after the concrete was placed, during which the temperature of the air surrounding the concrete is above 50 degrees Fahrenheit. The times may be increased or decreased as directed by the Landscape Architect, dependent on air temperatures, cement type, concrete additives or other conditions of the Work in accordance with ACI 347R.

3.5 RESHORING

A. When removing forms before structural members are strong enough to carry dead load and/or construction loads, reshores will be installed to assure safe distribution of loading. Reshoring operations will be planned in advance and will be subject to the Landscape Architect's review. During reshoring, no construction loads will be permitted on the new construction.

B. Reshores will be placed as soon as practicable after form removal, but in no case later than the end of the working day on which form removal occurs, and will remain in place until the concrete has acquired the required strength.

END OF SECTION

SECTION 03 15 00
CONCRETE ACCESSORIES

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section includes joint fillers, joint sealants, waterstops, and miscellaneous embedded items in concrete.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 11 00 - Concrete Forming

B. Section 03 20 00 - Concrete Reinforcing

C. Section 03 30 00 - Cast-in-Place Concrete

1.3 REFERENCE STANDARDS

A. ASTM A193/A193M - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications

B. ASTM A194/A194M - Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both

C. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts

D. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel

E. ASTM D994/D994M - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)

F. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

G. ASTM D1752 - Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction

H. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

I. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions

J. COE CRD-C 513 -Handbook for Concrete and Cement Corps of Engineers Specifications for Rubber Waterstops

K. COE CRD-C 572 - Handbook for Concrete and Cement Corps of Engineers Specifications for Polyvinylchloride Waterstop

1.4 SUBMITTALS

A. Submit certified manufacturer's affidavits for expansion joint filler, joint sealant and waterstops to verify compliance with the applicable Specifications.

B. Submit a schedule of concrete pouring and indicate locations of proposed construction and expansion joints. This schedule is subject to approval of the Landscape Architect.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Environmental requirements relative to temperature for placing joint sealants are specified in Part 3 of this Section.

1.6 SEQUENCING

A. Contractor will sequence installation of miscellaneous embedded items with the Work of Section 03 11 00, Section 03 20 00 and Section 03 30 00.

PART 2 PRODUCTS

2.1 JOINT FILLER

A. Preformed Expansion Joint Filler for Concrete (Bituminous Type) ASTM D994/D994M.

B. Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types) ASTM D1751.

C. Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Concrete ASTM D1752.

2.2 JOINT SEALER

A. Joint Sealants, Hot-Poured, For Concrete and Asphalt Pavements ASTM D6690 Type II.

B. Joint Sealants, Hot-Poured, Elastomeric Type, for Portland Cement Concrete Pavements ASTM D6690, Type II or III.

2.3 WATERSTOPS

A. PVC waterstops will conform to COE CRD-C 572 polyvinyl chloride (PVC) or COE CRD-C 513 styrene-butadiene rubber (SBR). Use flat ribbed type in joints in walls and slabs where shown on the Drawings. Use center bulb type in expansion joints.

B. Bentonite waterstops will be a compound of 75% high swelling sodium bentonite and 25% butyl rubber. Bentonite waterstops require an adhesive as recommended by the manufacturer to adhere the waterstop to the substrate.

C. Hydrophilic rubber waterstop will be a combination of chloroprene rubber and chloroprene rubber modified to impart hydrophilic properties. The waterstop will have a delay coating to inhibit initial expansion due to moisture present in fresh concrete. Hydrophilic rubber waterstops require an adhesive as recommended by the manufacturer to adhere the waterstop to the substrate.

2.4 CONCRETE ANCHORS

A. General:

1. Select type and size to achieve required loading capacity using information provided by manufacturer. If required type is not indicated, select type appropriate to conditions and item being fastened.

2. Maintain critical edge distance and spacing per manufacturer's recommendations for all anchors. Provide tamper proof hardware when called for on the plans.

B. Adhesive Anchors:

1. Combination capsule adhesive and insert system; chisel pointed threaded rod with hex nut/washer, reinforcing bar, or internally threaded insert, installed into pre-drilled anchor hole using rotary hammer drill, crushing glass capsule containing two part epoxy acrylate resin (vinyl ester) with quartz aggregate and hardening agent, forming adhesive mortar.

2. Threaded rod: ASTM A193/A193M Grade B7, ASTM A194/A194M Grade 2H or ASTM A563/A563M Grade DH nuts, and ASTM F436/F436M washers; plated in accordance with ASTM B633, SC1, with Type II yellow chromate treatment or Type 304 stainless steel when specified on the plans.

3. Threaded Insert: Carbon steel tubular insert, internally threaded, plated in accordance with ASTM B633, SC1.

C. Wedge Type Anchors:

1. One piece body with expansion mechanism installed in pre-drilled hole using matching tolerance bit.

2. Carbon steel anchor body, washers, nuts and wedges, plated in accordance with ASTM B633, SC1, Type III or Type 304 stainless steel anchor body, washers, nuts and wedges when so indicated on plans.

PART 3 EXECUTION

3.1 CONTRACTOR'S VERIFICATION

A. Inspect the locations and surfaces to receive joint filler, joint sealer, or miscellaneous embedded items and correct defects or conflicts which will affect the proper performance of the item to be placed.

3.2 PREPARATION

A. Accessories to be embedded into concrete with contact surfaces are to be free of dirt, curing compound, protrusions of hardened concrete or any other foreign material which would affect bond with concrete.

B. Prime surfaces in accordance with manufacturer's recommendations.

3.3 INSTALLATION OF JOINT FILLERS

A. Details, including materials and methods of installation of joint fillers will be as indicated on the Plans and as approved by the Landscape Architect.

3.4 INSTALLATION OF JOINT SEALANTS

A. Do not seal joints when the sealant, air or concrete temperature is less than 40 degrees Fahrenheit. Install bond breaker and backup material where required, as indicated on the Plans, or in accordance with the manufacturer's recommendations.

3.5 INSTALLATION OF WATERSTOPS

A. Waterstops will be of maximum practicable length to minimize joints.

B. Position waterstops will be positioned as indicated on the Plans in a manner to permanently retain flexibility.

C. Splice in length or at intersections by heat sealing in accordance with manufacturer's recommendations.

D. Reform splices with a remolding iron with ribs or corrugations to match the pattern of the waterstop. When cooled and bent by hand in as sharp as an angle as possible, the splice will show no sign of separation.

E. Provide support and protection of the waterstops during the progress of the work. Replace or repair waterstops that are punctured or damaged at Contractor's expense. Concrete will be thoroughly consolidated in the vicinity of the waterstop. Provide suitable guards to protect exposed projecting edges and ends of partially embedded waterstops from damage when concrete placement has been discontinued.

3.6 CONCRETE ANCHORS

A. Do not begin installation until substrates have been properly prepared. Do not proceed with installation if substrate preparation is unsatisfactory.

B. Clean surfaces thoroughly prior to installation. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Install in accordance with manufacturer's instructions and recommendations and as required by applicable code. Anchor applied items neatly, with item mounted plumb and level unless otherwise indicated.

D. Landscape Architect reserves the right to require the anchor manufacturer's representative to demonstrate proper installation procedures for post-installed anchors and to observe Contractor's installation procedures, at no extra cost to Owner. Landscape Architect reserves the right to require pullout or shear tests to determine adequacy of anchors, at no extra cost to Owner.

3.7 MISCELLANEOUS EMBEDDED ITEMS

A. Place inserts and other embedded items required for adjoining Work or for its support prior to concreting.

B. Position embedded items accurately and supported against displacement. Fill voids in sleeves, inserts, and anchor slots temporarily with readily removable material to prevent the entry of concrete into the voids.

END OF SECTION

SECTION 03 20 00
CONCRETE REINFORCING

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section includes the furnishing, fabrication, placement and care of material used as concrete reinforcement.

B. Latest or current American Concrete Institute (ACI) standards and code requirements for concrete and reinforced concrete will govern concrete Work except where otherwise specified herein. Copies of standards can be obtained from the ACI.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 11 00 - Concrete Forming

B. Section 03 15 00 - Concrete Accessories

C. Section 03 30 00 - Cast-in-Place Concrete

1.3 ALLOWABLE TOLERANCES

A. Fabrication:

1. Sheared length: ±1 inch
2. Depth of truss bars: +0, -1/2 inch
3. Stirrups, ties, and spirals: ±1/2 inch
4. Other bends: ±1 inch.

B. Placement:

1. Concrete cover to form surfaces: ±1/4 inch
2. Minimum spacing between bars: -1/4 inch
3. Top bars in slabs and beams:
    a. Members8 inches deep or less: ±1/4 inch
    b. Members more than 8 inches but not 24 inches over deep: ±1/2 inch
    c. Members more than 24 inches deep: ±1 inch
4. Crosswise of members: Spaced evenly within 2 inches of stated separation.
5. Lengthwise of members: ±2 inches
6. Maximum bar movement to avoid interference with other reinforcing steel, conduits, or embedded items: 1-bar diameter, with approval from the Landscape Architect.

1.4 SOURCE QUALITY CONTROL

A. Reinforcing steel will be subject to inspection at the source of supply, fabricator, or after delivery to the Project Site at the discretion of the Landscape Architect.

B. Contractor may be required to furnish additional test of reinforcing steel for each 100 ton or fraction thereof. Testing for bend, pull, elongation and weight to assure compliance with specifications will be in accordance with ASTM A370.

1.5 REFERENCE STANDARDS

A. ACI SP-66: ACI Detailing Manual

B. ACI 301: Specifications for Concrete Construction

C. ACI 318: Building Code Requirements for Structural Concrete and Commentary.

D. ASTM A184/A184M: Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement

E. ASTM A370: Standard Test Methods and Definitions for Mechanical Testing of Steel Products

F. ASTM A615/A615M: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

G. ASTM A706/A706M: Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement

H. ASTM A996/A996M: Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement

I. ASTM A1064/A1064M: Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

J. ASTM C55: Standard Specification for Concrete Building Brick.

K. ASTM E329: Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

L. CRSI (DA4): Manual of Standard Practice

1.6 SUBMITTALS

A. Submit shop drawings that indicate the size and dimensions for fabricating and placing reinforcing steel. Include bar schedules, stirrup spacing, and the diameter of bend bars. Indicate the type and grade of bar supports.

B. Submit the manufacturer's laboratory test certificates. These certificates must identify the chemical and physical analysis of each load of reinforcing steel that's delivered.

C. Submit test certificates from a qualified independent testing agency. These certificates should document the agency's evaluation of the mechanical splice devices, ensuring they comply with ACI 318.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver reinforcement to Project site in bundles tagged and marked in accordance with CRSI (DA4).

B. Store reinforcing steel above ground on platforms or other supports, in an orderly manner to facilitate inspection and checking, and be protected from physical injuries or contamination.

1.8 SEQUENCING

A. Coordinate the placement of reinforcing steel so it doesn't prevent the proper and timely completion of dependent construction phases.

PART 2 PRODUCTS

2.1 REINFORCING BARS

A. Use reinforcement of the grade and type as specified herein unless otherwise indicated on the Plans or Shop Drawing.

B. Bars:

1. Deformed and Plain Billet-Steel Bars: ASTM A615/A615M, Grade 60.
2. Rail-Steel and Axle Steel Deformed and Plain Bars: ASTM A996/A996M, Grade 60.
3. Low Alloy Steel Deformed Bars: ASTM A706/A706M.

C. Mats:

1. Ensure fabricated steel bar or rod mats of the clipped type conform to ASTM A184/A184M.

2.2 WELDED WIRE FABRIC

A. Use welded wire fabric in flat mats only.

B. Plain:

1. Conform to ASTM A1064/A1064M, 6 x 6 – w2.9 x w2.9 unless otherwise indicated on the Plans.

C. Deformed:

1. Conform to ASTM A1064/A1064M, 6 x 6 – w2.9 x w2.9 unless otherwise indicated on the Plans.

2.3 TIE WIRE

A. Plain:

1. Conform to Cold Drawn Steel Wire for Concrete Reinforcement ASTM A1064/A1064M, 16-gauge minimum size.

B. Deformed:

1. Conform to Deformed Steel Wire for Concrete Reinforcement, ASTM A1064/A1064M, size D-4 minimum.

2.4 BAR SUPPORTS

A. Fabricate metal bar supports from cold-drawn steel wire in accordance with current CRSI Standards.

B. For stainless steel supports, use Type 1. Attach stainless steel wire, conforming to ASTM A493, to the tips of the support. This ensures the non-stainless wire will be no closer than 1/4 inch from the form surface.

C. Use Type 1 plastic-coated supports. Ensure the plastic coating on the legs and tips is polyethylene, conforming to ASTM D1248.

D. Ensure precast concrete brick supports conform to ASTM C55, Type 1, Grade N.

2.5 FABRICATION

A. Bend bars cold to the shapes and dimensions shown on the Plans, or as required by the current "Manual of Standard Practice" of the CRSI. Do not bend or straighten steel in a way that injures the material. Do not use bars with kinks or improper bends.

B. For standard hooks, excluding stirrups and tie hooks, the diameter of the bend, measured on the inside of the bar, must meet or exceed the values in the following table.

Minimum Diameters of Bend	
Bar Size	**Minimum Diameter**
#3 through #8	6 bar diameters
#9, #10 and #11	8 bar diamters
#14 and #18	10 bar diameters

C. For stirrups and ties using number #5 bar and smaller, bends must be at least four bar diameters. For bars larger than No.#5, refer to the “Minimum Diameter of Bend” table above for bend requirements.

D. Ensure bends for stirrups and ties for welded wire fabric are at least 4-bar diameters for deformed wire larger than D-6, and at least 2-bar diameters for all other wires. If a bend has an inside diameter of less than 8-bar diameters, ensure it's at least 4-bar diameters from the nearest welded intersection.

PART 3 EXECUTION

3.1 CONTRACTOR'S VERIFICATION

A. Examine the areas in which the reinforcing steel is to be placed to assure proper lines and levels.

3.2 PREPARATION

A. Remove dirt, grease, oil, loose mill scale, excessive rust, and foreign matter that will reduce bond with concrete or splicing method.

B. Cut the ends of bars to be butt spliced square and smooth.

3.3 INSTALLATION - GENERAL

A. Place reinforcing as indicated on the approved Shop Drawings, within allowable tolerances. Use bar supports, as shown on the approved Shop Drawings or in the Specifications, to properly separate and support the reinforcing steel.

3.4 MINIMUM COVER AND SPACING

A. Unless the Plans indicate otherwise, maintain the following minimum bar spacing:

B. For footings and other principal structural members where concrete is deposited against the ground, ensure 3 inches of concrete between the bar and the ground contact surface.

C. Protect concrete surfaces that will be exposed to weather, in contact with the ground, or in contact with liquids after form removal with 2 inches of concrete.

D. For reinforcement at surfaces not directly exposed to the ground, liquids, or weather, provide a concrete protective covering of 3/4 inch for slabs and walls, and 1-1/2 inches for beams and girders.

E. Protect column spirals or ties everywhere with a concrete covering cast monolithically with the core. Ensure this covering is at least 1-1/2 inches thick.

F. Ensure concrete protection for reinforcement is always at least equal to the diameter of bars, except for concrete slabs as noted above.

G. Maintain a minimum center-to-center distance between parallel bars of 2-1/2 times the diameter of the bars. Ensure the clear spacing between bars is never less than 1 inch, nor less than 1-1/3 times the maximum size of the coarse aggregate. Ensurehe maximum center to center distance in parallel bars is 18 inches.

H. When placing reinforcement in beams and girders in two (2) or more layers, the clear distance between layers must be at least 1 inch. Also, place the bars in the upper layers directly above those in the bottom layer.

I. For welded wire fabric designated as load-carrying reinforcement, overlap successive mats where continuous. Ensure the overlap, measured between the outermost cross wires of each fabric sheet, is no less than the spacing of the cross wires plus 2 inches. Support it as required for reinforcing bars.

3.5 SPLICING

A. Avoid splices at points of maximum stress. Splice bars in accordance with ACI 318.

B. Splice bars by overlapping in accordance with ACI SP-66. Securely lace them with wire unless the Plans or approved Shop Drawings indicate otherwise.

C. Lap adjoining wire mesh by no less than one (1) full mesh and lace securely with wire. Offset end laps in adjacent widths to prevent continuous splice.

D. Overlap successive mats of welded wire fabric reinforcement wherever they are continuous. The overlap, measured between the outermost cross wires of each fabric sheet, must be no less than one full mesh spacing plus 2 inches. Extend the fabric across supporting beams and walls and to within four 4 inches of concrete edges. It may extend through contraction joints where alternate wires are field cut. Adequately support the fabric during concrete placement to ensure its proper position in the slab either by the methods of Part 3 of this Section or by laying the fabric on a layer of the fresh concrete of the correct depth before placing the upper layer of the slab.

E. Offset vertical bars in columns by at least 1-bar diameter at lapped splices. To ensure proper placement, furnish templates for all column dowels.

F. For bars size #14 and #18 or larger, where size #11 bars are butt spliced to larger sizes, and/or when approved by the Landscape Architect, weld them with full penetration butt welds in accordance with ACI 301. Adequate jigs and clamps or other devices must be provided by the Contractor to support, align and hold the longitudinal centerline of the bars in a straight line.

G. Bars larger than #11 may be butt spliced by mechanical devices approved by the Landscape Architect, in accordance with ACI 318. Use the manufacturer's standard jigs, clamps, ignition devices, and other required accessories to support, align, and hold the longitudinal centerline of the bars in a straight line.

3.6 SECURING REINFORCEMENT

A. Securely lace reinforcement with wire to supports or other reinforcing to prevent displacement during concrete placement, as required by the current CRSI (DA4).

3.7 FIELD QUALITY CONTROL

A. Landscape Architect will inspect the reinforcing steel after installation. Landscape Architect must approve the reinforcing steel placement before concrete placement.

B. Avoid displacing the reinforcing steel during concrete placement.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section includes monolithic cast-in-place concrete work complete with materials, mixes, installation and testing.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 33 00 - Submittal Procedures

B. Section 03 15 00 - Concrete Accessories

C. Section 03 20 00 - Concrete Reinforcing

D. Section 03 60 00 - Grouting

E. Section 05 12 00 - Structural Steel Framing

F. Section 07 10 00 - Dampproofing and Waterproofing

G. Section 31 23 19 - Dewatering

1.3 REFERENCE STANDARDS

A. ACI 312.3R - Report on Chemical Admixtures for Concrete

B. ACI 301 - Specifications for Concrete Construction

C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete

D. ACI 305R - Guide to Hot Weather Concreting

E. ACI 306R - Guide to Cold Weather Concreting

F. ACI 318: Building Code Requirements for Structural Concrete (ACI 318-19) Commentary on Building Code Requirements for Structural Concrete

G. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field

H. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

I. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

J. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete

K. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete

L. ASTM C150/C150M - Standard Specification for Portland Cement

M. ASTM C172/C172M Standard Practice for Sampling Freshly Mixed Concrete

N. ASTM C183 - Standard Practice for Sampling and the Amount of Testing of Hydraulic Cement

O. ASTM C231 - Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method.

P. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete

Q. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

R. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete

S. ASTM C595/C595M - Standard Specification for Blended Hydraulic Cements

T. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

U. ASTM C989/C989M - Standard Specification for Slag Cement for Use in Concrete and Mortars

V. ASTM D75 / D75M - 19 Standard Practice for Sampling Aggregates

1.4 REFERENCE SPECIFICATIONS

A. The latest or current ACI Standards and Code Requirements for "Concrete and Reinforced Concrete" will govern all concrete Work except where otherwise specified herein.

B. Michigan Department of Transportation, Standard Specifications for Construction, latest edition (MDOT)

1.5 TESTING AGENCY

A. Inspections and tests required by this Section will be performed by organizations acceptable to the Landscape Architect.

1.6 ALLOWABLE TOLERANCES

A. See Section 03 11 00 for the allowable tolerances for concrete surfaces.

1.7 DESIGN CRITERIA

A. Design and test mixes for each size and gradation of aggregates and for each consistency intended for use. Design quantities and test results of each mix will be submitted for review and approval by the Landscape Architect.

B. Necessary construction joints are shown on the Plans. Modification of location or placement of construction joints not indicated on the Plans are subject to approval of the Landscape Architect. In general, joints should be located within the middle one-third of the span of slabs, beams, and girders unless a beam intersects a girder at this point, in which case the joint in the girder will be offset a distance equal to twice the width of the beam.

C. Joints in walls and columns will be at the underside of floors, slabs, beams, or girders and at the tops of footings or floor slabs. Place beams, girders, brackets, column capitals, haunches, and drop panels at the same time as slabs. Joints will be perpendicular to the main reinforcement.

D. Expansion joint locations and details will be as shown on the Plans. In no case will any fixed metal be continuous through a expansion joint.

E. Provide keyways in all joints where required to provide for either shear or watertightness. Unless otherwise required, the width of keys will be at least one-third the thickness of the section at that point and their depth at least one-third their width.

1.8 SOURCE QUALITY CONTROL

A. Furnish tests of cement and aggregates. Material sampling will conform to the following:

1. Cement: ASTM C183
2. Aggregates: ASTM D75

B. Conduct tests for the following quantities, or fraction thereof:

1. Cement: 550 tons
2. Fine Aggregate: 2,000 tons
3. Course Aggregate: 2,000 tons

C. Use same brand cement for any given structure produced by a single mill unless otherwise provided by authorization of the Landscape Architect.

1.9 SUBMITTALS

A. Submit shop drawings showing the location of joints, as well as a schedule of the concrete pour(s), for review and approval by the Landscape Architect.

B. Submit concrete mixture designs and test data for review by the Landscape Architect. Concrete will not be placed until the Contractor has received such approval in writing.

C. Each mixture report will include:

1. Slump
2. Total gallons of water per cubic yard
3. Brand, type, composition, and quantity of cement
4. Brand, type, composition, and quantity of pozzolan or other mineral admixtures
5. Brand, type, composition, and quantity of ground granulated blast furnace slag
6. Specific gravity and gradation of each aggregate
7. Ratio of fine to total aggregates
8. Weight (surface dry) of each aggregate in pounds per cubic yard
9. Brand, type, ASTM designation, active chemical ingredients, and quantity of each admixture
10. Air content
11. Compressive strength based on 7-day and 28-day compression tests
12. Time of initial set

D. Submit manufacturer's literature of abrasive wear resistant floor finish and of chemical curing compound for review and approval by the Landscape Architect.

E. Submit a sample concrete delivery ticket for review by the Landscape Architect.

F. Submit tickets collected at the site of concrete placement accompanying each load of concrete. A printout system for producing these tickets in connection with automatic batching will be permitted.

1. Each ticket will be serially numbered, show the charging time, quantity and grade of concrete, location of delivery and the signatures of inspectors at the plant and site. Transit mixed concrete tickets will also include revolution counter reading at charging and mixing completion.

G. Submit reports of the sampling and testing of slump, air content and strength performed.

H. Submit reports of nondestructive, core and/or liquid retention testing required for acceptance of concrete in place.

1.10 MATERIAL STORAGE AND HANDLING

A. Store and handle materials sin accordance with ACI 304R and as specified herein.

B. When permission is given to store cement in the open, materials will be placed at least 6 inches above the ground and a waterproof covering will be provided and placed as to ensure runoff in case of rain.

C. Thoroughly shake cement sacks when emptying into the batch. Cement salvaged by the Contractor by cleaning sacks mechanically or otherwise, or from discarded sacks of cement, will not be used in the Work. The use of a fractional sack of cement will not be permitted unless the fractional part is measured by weight. At the time of its use in the Work, the cement must be free from lumps.

D. No aggregates which have become intermixed prior to proportioning will be used. Sufficient aggregate must be available at the site to preclude the possibility of delays while placing the concrete.

E. Cars used for shipping aggregates must be clean and in good repair. The use of straw, marsh, hay or other similar materials for closing cracks or holes in cars will not be tolerated.

F. Store and handle pozzolans and other cementitious materials in the manner of cement.

G. Store and handle curing compound in a manner to prevent contamination.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Environmental requirements will be in accordance with ACI 305R for hot weather concreting, and ACI 306R for cold weather concreting.

B. Specific temperature requirements are contained in Part 2 of this Section for mixing and Part 3 of this Section for placing concrete.

PART 2 PRODUCTS

2.1 MATERIALS - GENERAL

A. Materials will meet the requirements of ACI 301, ACI 318, and MDOT Specification, Division 9.

B. Test and inspect concrete materials will be tested and inspected as the Work progresses. The review and/or check-test of the proposed materials, securing of production samples of materials at plant stockpiles and/or review of the manufacturer's reports for compliance will be incidental to the Contract.

C. Testing and inspection required due to substitution or change of materials requested by the Contractor will be at the Contractor's expense.

2.2 CEMENT

A. Cement will be the type as indicated on the Plans or as specified:

1. Type I and IA, conforming to ASTM C150/C150M, air-entraining Portland cement when special properties are not specified.

2. Type III and IIIA, conforming to ASTM C150/C150M, air-entraining Portland cement for use when high-early strength is specified.

3. Type IS and IS-A, conforming to ASTM C595/C595M, air-entraining Portland blast-furnace slag cement for use in general concrete construction.

4. Type IP and IP-A, conforming to ASTM C595/C595M, air-entraining Portland-Pozzolan cement for use in general construction. The addition of suffix (MS) signifies that moderate sulfate resistance is specified. The addition of suffix (MH) signifies that moderate heat of hydration is specified.

2.3 AGGREGATES

A. Washing will be required to eliminate the dust, clay, or silt coating. Aggregates which have been washed will not be used sooner than 24 hours after washing, unless approved by the Landscape Architect in writing.

B. Coarse aggregate will be gravel or crushed rock, conforming to MDOT Section 902.03. Class17A for members 8 inches or less in thickness and Class 6AA for other construction.

1. Gravel will consist of hard, clean, durable particles of rock or pebbles and will be free from lumps of clay.

2. Crushed rock will consist of angular fragments of crushed hard heads or boulders or crushed igneous rock free from weathered rock and of uniform quality.

3. Sieve and screen analysis determination of clay, silt, and dust content and percentages of objectionable particles will be based on dry weights and conform to MDOT Section 902.03, Table 902-1, "Grading Requirements for Coarse Aggregates, Dense-Graded Aggregates, and Open Graded Aggregates" and Table 902-2, "Physical Requirements for Coarse Aggregate, Dense Graded Aggregates and Open Graded Aggregates".

C. Fine aggregate will be sand size 2NS in accordance with MDOT Section 902.08.

1. Fine aggregates will consist of sharp sand which will be composed of clean, hard, durable grains and will be free from lumps of clay and organic deleterious substances.
2. Fine aggregates will conform to MDOT Section 902.09 and Table 902-4, "Grading Requirements for Fine Aggregates".

2.4 ADMIXTURES

A. Admixtures approved by the Landscape Architect may be used to achieve concrete as indicated on the Plans or specified herein. Calcium chloride will not be allowed.
   1. Air-entraining, conforming to ASTM C260/C260M.
   2. Pozzolan and fly ash, conforming to ASTM C618, Class F.
   3. Water reducing, conforming to ASTM C494/C494M.
   4. Retarder, conforming to ASTM C494/C494M.
   5. Plasticizer, conforming to ASTM C494/C494M.
   6. Ground granulated blast furnace slag conforming to ASTM C989/C989M, Grade 100.
B. Abrasive wear resistant floor finish will be packaged, dry combination of Portland cement, graded quartz aggregate and dispersing agents formulated to produce an abrasive and wear resistant monolithic surface.

2.5 JOINT FILLER

A. See Section 03 15 00 - Concrete Accessories.

2.6 WATER

A. Water will be free from oil, acid, alkali, organic matter, and other deleterious substances. Water approved by the Local Board of Health may be used without testing. Water from other sources must be tested before using.

2.7 CURING COMPOUND

A. A curing compound, conforming to ASTM C309 and approved of by the Landscape Architect, may be used to prevent checking, cracking and loss of moisture.

2.8 MIXES

A. Concrete will consist of a mixture of air-entraining Portland cement, coarse and fine aggregate, Class F fly ash, and water with admixtures if required.
B. The mixture, combined in proportions, will meet the requirements of MDOT Section 701 and ACI 211.1.
C. Concrete will be classified and proportioned on the basis of minimum compressive strength at 28 days when cured in a moist room at a temperature within the range of 68 - 75 degrees F. The desired strength of the concrete is 3,500 psi unless otherwise shown on the Plans or specified herein.

D. Table 1 shows for each grade of concrete the minimum compressive strength, cement content, and the modulus of rupture.

Table 1 - Concrete Mixtures

Concrete Grade	Coarse Agg	Type of Cement	Cement Content	Min Compressive Strength @ 28 days	Min Modulus of Rupture @ 28 days	% Air
4500 psi	6AA	I, IA, IS, IS-A	658 lbs/cyd	4500 psi	725 psi	4 - 6
4000 psi	6AA or 17A	I, IA, IS, IS-A	611 lbs/cyd	4000 psi	700 psi	4 - 6
3500 psi	6AA or 17A	IS, IS-A, IP, IP-A	564 lbs/cyd	3500 psi	650 psi	4 - 6

1. Water cement ration will be 0.45, maximum.
2. Structural concrete for walls and slabs will be placed with a slump of 4 inches, maximum.
3. Ground granulated blast furnace slag (GGBFS) may be substituted for cement on a pound for pound basis from a minimum of 25% up to a maximum of 40% GGBFS and 60% cement.
4. Minimum fly ash content in the mix will be 25%, additional fly ash may be substituted for cement on a pound for pound basis up to a maximum of 40% fly ash and 60% cement when approved by the Landscape Architect.
5. Maximum total replacement of cement will not exceed 40%.

E. Proportion aggregates by weight, except for small structures and for incidental Work requiring less than 10 cubic yards of concrete, in which case they may be proportioned by volume when approved by the Landscape Architect.

F. Proportion cement by weight in bulk, when approved by the Landscape Architect.

G. When proportioned by volume, the amount of each aggregate required for a single batch will be measured separately and accurately. Shovel methods of measuring will not be permitted. The unit of volumetric measurement will be 1 cubic yard.

H. When proportioned by weight, the amount of each aggregate required for a single batch will be weighed in a separate container. The equipment for weighing will be of an approved type, and of such accuracy that there will not be an error of more than 1% in any single batch.

2.9 BATCHING ADMIXTURES

A. The batching of admixtures to achieve and maintain production of the mix design of concrete will be in accordance with ACI 212.3R.

B. If the air content is found to be less or greater than the specified amount, the Contractor will immediately discontinue Work and correct the air content.

1. Decreasing the air content may be accomplished by blending air-entraining Portland cement with Portland cement, manufactured at the same mill, in a ratio which will reduce the air content to a value within the specified limits, this blending will be reviewed by the Landscape Architect.
2. Increasing the air content may be accomplished by adding to each batch a sufficient amount of air-entraining admixture to bring the air content up to the designed amount.

C. Pozzolan and ground granulated blast furnace slag will be proportioned based on the mix design approved by the Landscape Architect to produce watertight concrete.

D. A water reducer may be used to reduce the water requirement of concrete to obtain consistency of slump, modify workability, increase strength or any other approved use.

2.10 TEMPERATURE LIMITS OF MIXTURE

A. The temperature of the cement, at the time of delivery to the mixer, will not exceed 165 degrees Fahrenheit. The cement will be stored at the Contractor's expense until cooled to that temperature.

B. The temperature limits of aggregates and water entering the mixer will be in accordance with Table 2:

Table 2 - Temperature Limits

Component	Minimum	Maximum
Water	75°F (24°C)	140°F (60°C)
Fine Aggregate	65°F (18°C)	140°F (60°C)
Coarse Aggregate	65°F (18°C)	110°F (43°C)
Concrete (resulting)	60°F (15°C)	90°F (32°C)

2.11 MIXERS AND MIXING

A. Concrete mixing operations will be in accordance with ACI 304 and MDOT Section 701, and will be subject to random inspection during the progress of the Work and will be incidental to the Contract.

B. Central Mixed Concrete:

1. Mixers will be capable of quickly and completely discharging without segregation or loss.
2. Efficiency of the mixers will be maintained at all times through repair or replacement of worn parts when necessary.
3. Mixers will be provided with readily adjustable, automatic devices which will measure the cement and water within 1% and admixtures within 3%.
4. The drum of the mixer will be kept free from hardened concrete and will be completely emptied before recharging.
5. Re-tempering or remixing concrete that has partially set will not be permitted.

6. Mixer will be cleaned thoroughly each time when out of operation for more than 30 minutes.
    a. Recommended mixing time is a minimum time of 1 cubic yard, with an additional 15 seconds for each additional 1 cubic yard.
7. Concrete will be delivered to the site in clean, tight truck bodies designed for this purpose and painted with paraffin if necessary for easy dumping.
8. The concrete at the point of delivery will have the proper consistency and will be free from segregation.
9. Mechanical agitators in the truck bodies will be required if the period of time from the mixing plant to the point of dumping exceeds 30 minutes.
10. No concrete will be dumped if the elapsed time from the mixing plant to the point of dumping exceeds 60 minutes.

C. Transit Mixed Concrete:
    1. Transit-mix concrete will be in accordance with ASTM C94/C94M. If transit-mix concrete is used, it will meet all the foregoing requirements specified for central mixed concrete and, in addition, the following:
        a. Batched materials will be properly proportioned and in a dry state. The proper amount of water will be added to the mixer on the trucks, and no additional water will be added. No admixtures or accelerators will be added except as herein noted, without the approval of the Landscape Architect.
        b. Do not load trucks beyond their rated capacity. Mixing drums must cleaned of all set-up materials at frequent intervals while in use. Trucks with leaking water valves will not be used.
        c. Recommended mixing speed should be no less than 12 revolutions per minute, with a minimum of 90 revolutions or until the mix is satisfactory.
        d. Continuously mix after adding water to the drum. However, do not place any concrete in the forms more than 90 minutes after you add water to the mix.
        e. Deliver truck-mixed concrete to the site of the Work and discharge it from the mixer within the maximum period of 90 minutes from the first introduction of water to the mix. Any concrete which remains in the mixer after this period and any concrete which appears too stiff to be properly workable or which appears to have begun to take its initial set will be rejected and removed from the site of the Work.

D. Owner may employ an independent testing laboratory to provide a qualified inspector to be present at the plant where batching of concrete occurs at the expense of the Owner. The inspector will verify the compliance of the mix with the Contract Documents and will sign a form indicating the quantity of concrete and the concrete mixture of each load.

2.12 CHANGE OF MIXTURE

A. If the Contractor requests a change or substitution of approved batch proportioning, mixing, or delivery operations additional testing and/or inspection will be at Contractor's expense.

2.13 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers of abrasive wear resistant floor finish include:

1. Master Builders Company, "Mastercon Aggregate"
2. Sonneborn Building Products, "Harcol"
3. Approved equal

PART 3 EXECUTION

3.1 VERIFICATION OF FORMWORK, REINFORCING, AND SUBGRADES

A. Inspect formwork, reinforcement and subgrades to confirm compliance with the related Work specified elsewhere.

3.2 EMBEDDED ITEMS

A. Verify the location, from certified vendor or applicable Contract Drawings, of embedded items, including anchor bolts, wall sleeves, wall casting, railing post sleeves and miscellaneous pipes and conduits. Install these items accurately at the determined locations.

3.3 BUILDING IN OTHER WORK

A. Make all necessary provisions in concrete Work for other Work installed by this or other contractors, and build in all required steel beams, frames, curbs, expansion joints, inserts, hangers, pipes, floor drains, pipe trench covers and frames, anchors, sleeves, floor ducts, fiber and steel conduit, pipe hanger sockets, and all other Work furnished by either this or other contractors.

B. Build in all anchors, ties, etc., specified under brick and other Work, in faces of concrete Work which are to be faced with masonry, and any other Work shown or noted to be built into concrete. In addition, Contractor will provide all openings and holes in concrete Work as shown or as needed to accommodate other Work.

3.4 SPECIAL CONCRETE

A. Verify the use and/or locations of watertight concrete and/or high-early strength concrete.

3.5 PREPARATION

A. Notify the Landscape Architect a minimum of 2 working days prior to placement of concrete.

B. Before depositing new concrete on or against existing concrete the existing concrete will be roughened, thoroughly cleaned of foreign matter and laitance, and saturated with water. The cleaned and saturated surface of the hardened concrete, including vertical and inclined surfaces, will be coated with a bonding agent or slushed with a minimum 2 inch thick coating of concrete without coarse aggregate grout against which the new concrete will be placed before the mixture has attained its initial set.

C. Before concrete is placed in any unit, the forms and the placing and fixing of all steel and incidental items must be complete, and the forms, steel and adjacent concrete will be thoroughly cleaned and wetted down.

D. Where indicated on the Plans, the Contractor will bridge the subgrade with at least 2000 psi, 3 inch thick lean concrete before placing the reinforcement an no additional cost to Owner.

E. Do not deposit concrete in any unit until the area has been completely dewatered in accordance with Section 31 23 19, and not until after the Contractor has made satisfactory provisions to eliminate all possibility of water entering or flowing through the concrete while it is being poured or is taking its set. Concrete will not be placed under or on water.

3.6 CONVEYING

A. Concrete handling equipment will be of such a nature and will be so located that the concrete after leaving the mixer will reach its destination with a minimum lapse of time, with no segregation, and loss of slump. The use of drop chutes, except at or in the forms, is prohibited.

B. The interior hopper slope of concrete buckets will be not less than 60 degrees from the horizontal, the minimum dimension of the clear gate opening will be at least 5 times the nominal maximum size aggregate and the area of the gate opening will be not less than 2 square feet.

1. Maximum dimension will not be greater than 2 times the minimum dimension.

2. Bucket gates must be essentially grout tight when closed and may be manually, pneumatically or hydraulically operated except for buckets larger than 2 cubic yards will not be manually operated.

3. Design of the bucket will provide means for positive regulation of the amount and rate of deposit of concrete in each dumping position.

C. Belt conveyors will be designed and operated to assure a uniform flow of concrete from mixer to final place of deposit without segregation of ingredients or loss of mortar and will be provided with positive means for preventing segregation of the concrete at the transfer points and the point of placing.

D. Concrete may be conveyed by positive displacement pump when authorized by the Landscape Architect. The pumping equipment will be piston or squeeze pressure type and constructed of rigid steel pipe or heavy duty flexible rubber hose. The inside diameter of the pipe will be at least 3 times the nominal maximum size coarse aggregate in the concrete mixture to be pumped. The maximum size coarse aggregate will not be reduced to accommodate the pumps.

E. The distance to be pumped must not exceed limits recommended by the pump manufacturer. The concrete will be supplied to the pump continuously. When pumping is completed, concrete remaining in the pipeline will be ejected without contamination of concrete in place. After each operation, equipment must be thoroughly cleaned, and flushing water wasted outside of the forms.

3.7 PLACING

A. Deposit concrete so as to maintain the top surface level, unless otherwise shown on the Plans, and also as to avoid any appreciable flow in the mass.

B. Where placing operations involve dropping the concrete more than 3 feet in the forms, concrete will be deposited through sheet metal or other approved spouts or pipes. These spouts or pipes will have suitable receiving hoppers at the upper ends, and the lower ends will be kept within 6 inch of the newly placed concrete so as to prevent segregation and avoid spattering the reinforcing steel with mortar. Under no circumstances will concrete that has partly hardened be deposited in the Work.

C. Each layer of concrete will be plastic when covered with the following layer and the forms will be filled at a rate of vertical rise of not less than 2 feet per hour. Concrete vibrators will penetrate the initial layer when placing the following layer. Vertical construction joints will be provided as necessary to comply with these requirements.

D. Concrete must be placed and compacted in wall or column forms before any reinforcing steel is placed in the system to be supported by such walls or columns. The portion of any wall or column placed monolithically with a floor or roof slab will not exceed 6 feet of vertical height. Concrete in walls or columns will set at least 2 hours before concrete is placed in the structural systems to be supported by such walls or columns.

E. Concrete must be set when top finished. Laitance, debris, and surplus water will be removed from concrete surfaces at tops of forms by screeding, scraping, or other effective means. Wherever the top of a wall will be exposed to weathering, the forms will be overfilled and after the concrete has settled, the excess will be screeded off.

F. Do not place concrete in contact with frozen ground.

G. Time between charging and placement of concrete must not exceed 90 minutes.

H. Concrete will be compacted by continuous vibrating, tamping, spading or slicing. Care must be taken to eliminate all voids and to provide full bond on reinforcing steel and embedded fixtures. Mechanical vibration will be employed. Concrete will be compacted and thoroughly worked with suitable tools combined with the use of vibrators applied internally and providing a frequency not less than 7,000 revolutions per minute. All such vibrating, including the methods and equipment, will be subject to the review of the Landscape Architect.

I. The time of vibrating in any area will only be sufficient to get efficient compaction, but in no case be carried to the point where there is segregation of the fine and coarse materials of the mix. There will be an absolute minimum of direct vibration of the steel or forms during the process of vibrating. Vibrators will be inserted and withdrawn from the concrete at numerous locations, from 18 - 30 inches apart, but will not be used to transport concrete within the forms. Contractor will have a stand by vibrator on the job site during concrete pouring operations.

3.8 FINISHING UNFORMED SURFACES

A. The unformed surfaces of all concrete will be screeded and given an initial float finish followed by steel troweling.

B. Screeding will provide a concrete surface conforming to the proper elevation and contour with all aggregates completely embedded in mortar. Screeded surfaces must be free of surface irregularities with a height or depth in excess of 1/4 inch as measured from a 10 foot straightedge.

C. Screeded surfaces will be given an initial float finish as soon as the concrete has stiffened sufficiently for proper working. Any piece of coarse aggregate which is disturbed by the float or which causes a surface irregularity will be removed and replaced with mortar. Initial floating will produce a surface of uniform texture and appearance with no unnecessary working of the surface. Floating will be performed with hand floats or suitable mechanical compactor floats.

D. Troweling will be performed after the second floating when the surface has hardened sufficiently to prevent an excess of fines being drawn to the surface. Troweling will produce a dense, smooth, uniform surface free from blemishes and trowel marks. The top surface of driveways, and sidewalks will be given a broomed finish after troweling.

E. Unless specified to be beveled, exposed edges of floated or troweled surfaces will be edged with a tool having 1/4 inch corner radius.

3.9 FINISHING FORMED SURFACES

A. After removal of forms, the finishing of all concrete surfaces will be started as soon as its condition will permit.

B. Grind all seams, fins or projections flush with the concrete surface.

C. Fill and point all honeycomb, tie holes and voids.

D. Dampen the surface with water and apply a cement and silica sand slurry to the entire surface to fill small defects and air voids.

E. Remove excess slurry from concrete. Surfaces to be finished will receive an application of dry Portland cement which will be rubbed into the slightly dampened surface with a suitable cloth.

F. After pointing and removal of projections as specified herein, exposed surfaces of concrete, including walls, columns, beams, pilasters and the undersides of slabs, will be given a rubbed surface finish.

3.10 FLOORS

A. Concrete floor finish will be applied to all building floors not receiving further floor finish. At these locations, the concrete will be brought to the proper elevation and screeded. The surface will be given 2 steel trowelings when the concrete has set sufficiently to finish smoothly. Floors will be sloped uniformly toward floor drains at a slope of 1/8 inch per foot.

B. Concrete finish on steps and loading platforms will be wood troweled to true and uniform surface and then steel troweled. The surface will then be slightly roughened with a broom or by dragging burlap across the surface.

C. Concrete floors will be finished with an abrasive resistant floor finish in the areas noted on the finish schedule on the Plans. Premixed floor hardener will be applied to the

surface of the freshly floated concrete floor, in strict accordance with the manufacturer's directions. Color to be selected by the Owner.

3.11 EXPANSION JOINTS

A. Comply with the requirements of Section 03 15 00. Expansion joints will have removable polystyrene joint caps secured to the top thereof and will be accurately positioned and secured against displacement to clean, smooth concrete surfaces.

B. Joint caps will be of the size required to install filler strips at the desired level below the finished concrete surface and to form the groove for the joint sealant to the size shown on the Plans.

C. Do not remove joint caps until after the concrete curing period.

3.12 CONCRETE CURING

A. Cure concrete for a period not less than 7 consecutive days. Contractor must have adequate equipment and curing material on the job site before concrete placement begins to prevent checking and cracking and loss of moisture from all the surfaces of the concrete. Protect concrete from rain, flowing water, wind and the direct rays of the sun. Seal openings in concrete to prevent drying of the concrete during the curing period.

B. Do not use curing compounds on surfaces to which additional concrete or other material are to be bonded.

C. Curing compounds must be applied in strict accordance with the manufacturer's recommendations.

D. Concrete cured with water must be kept wet by covering with ponded water or fog spraying to keep all surfaces continuously wet.

E. Horizontal construction joints and finished surfaces cured with sand will be covered a minimum thickness of 1 inch, uniformly, and kept saturated during the curing period.

F. Burlap used for curing will be treated to resist rot and fire and free of sizing or any substances that are injurious to Portland cement or cause discoloration. Lap strips by half widths. Saturate the burlap with water after placement and during the curing period.

G. Place straw or hay in a layer no less than 6 inch thick and hold it in place using screens, wire or other means to prevent dispersion by the wind. Care must be observed to avoid discoloration of the concrete surface from the vegetable fibers and for the flammability of the material. Saturate the straw or hay with water after placement and during the curing period.

3.13 ENVIRONMENTAL CONDITIONS

A. Provide cold or hot weather protection in accordance with ACI and as specified herein at no additional cost to the Owner.

B. Cold Weather Protection:

1. When placing concrete in cold weather, plan and execute the Work in a manner which will ensure results free from damage through freezing, contraction, and loss of concrete strength.

2. Do not pour concrete when the surrounding temperature is below 40 degrees Fahrenheit, unless the aggregates and water are properly heated. If concrete poured at higher temperatures has not attained a strength equal to 75% of the required strength for its class, house and protect it according to this Section's provisions whenever the surrounding temperature falls below 40 degrees Fahrenheit.
3. Apply heat to the materials in a manner which will keep these materials clean and free from injurious substances.
4. Aggregates may be heated only by steam coils or steam jets, except in the case of small quantities of concrete when other methods may be approved by the Landscape Architect. A sufficient quantity of properly heated aggregates must be on hand prior to starting the pouring of any unit.
5. Properly house concrete with canvas, burlap, or other windproof material in such a manner that any necessary removal of the forms or finishing of the concrete can proceed without undue damage to the concrete from the elements. Heating of the housing must be done in a manner which will maintain a temperature between 50 - 70 degrees Fahrenheit, at all times for at least 5 days after the pour is complete and 12 hours before the pour begins. Exhaust vent supplemental heating units sto the exterior so as to not cause deleterious reactions or deposits to occur to concrete.

C. Hot Weather Protection:

1. Concrete deposited in hot weather must not have a placing temperature that will cause difficulty from loss of slump, flash set, or cold joints. Concrete temperature must be less than 90 degrees Fahrenheit.
2. In hot weather, take suitable precautions to avoid drying of the concrete prior to finishing operations. Use of windbreaks, sunshades, fog sprays, or other devices will be provided by the Contractor at no additional cost to the Owner.

3.14 ADDITION OF WATER

A. To increase workability, adding water to the mix will be limited to a one time addition of 1 gallon per cubic yard and mixed with a minimum of 30 revolutions at a rate of 12 to 15 revolutions per minute. Addition of water will be within the slump requirements.

3.15 CONCRETE DELIVERY TICKET

A. Use a ticket system for recording the transportation of concrete from the batching plant to point of delivery. A ticket will be issued to the truck operator at the point of loading and given to the Landscape Architect upon delivery. At a minimum, each ticket will indicate the time of mixer charging, quantity of concrete, type of mixture including amount of cement, and the plant where the concrete was batched.

3.16 CONCRETE DELIVERY REJECTION

A. Concrete not permitted for inclusion in the Work by the Landscape Architect will be removed from the site. Rejection of concrete will be determined through concrete testing and elapsed time from mixer charging to delivery.

3.17 CONCRETE TESTING AT PLACEMENT

A. Test samples will be made of fresh concrete for each 50 cubic yards, or whenever consistency appears to vary. The cost of sampling and testing of slump, air content and strength will be incidental to the Contract.

B. Secure composite samples in accordance with ASTM C172/C172M.

C. Slump Test:

1. Slump tests will be in accordance with ASTM C143/C143M. Contractor will use the least slump possible consistent with workability for proper placing of the various classifications of concrete.

2. A tolerance of up to 1 inch above the indicated maximum slump will be allowed for individual batches provided the average for all batches or the most recent 10 batches tested, whichever is fewer, does not exceed the maximum limit.

D. Air Content:

1. Air content of normal weight concrete will be determined in accordance with ASTM C231.

E. Compressive Strength:

1. A set of cylinders for compressive strength tests will consist of four cylinders per each set. The temperature of concrete sample will be determined for each strength test.

2. Molding and curing specimens will be in accordance with ASTM C31/C31M. Record any deviations from the requirements of this standard in the test report.

3. Testing specimens will be in accordance with ASTM C39/C39M. Test one specimen 7 days for information and test another sample at 28 days for acceptance.

a. Acceptance test results will be the average of the strengths of the2 specimens tested at 28 days. If one specimen in a test manifests evidence of improper sampling, molding or testing, it will be discarded and the strength of the remaining cylinder will be considered the test result.

4. The strength level of the concrete will be considered satisfactory so long as the averages of all 28 day strength test results equal or exceed the specified 28-day strength and no individual strength test result falls below the specified 28-day strength by more than 500 psi.

5. If the strength test is not acceptable, further testing must be performed to qualify the concrete. The cost for additional testing will be paid for by the Contractor.

3.18 TESTING OF CONCRETE IN PLACE

A. Testing by impact hammer, sonoscope, or other nondestructive device may be permitted by the Landscape Architect to determine relative strengths at various locations in the structure as an aid in evaluating concrete strength in place or for selecting areas to be cored. Such tests, unless properly calibrated and correlated with other test data, will not be used as a basis for acceptance or rejection.

B. When required by the Landscape Architect, obtain and test cores at least 2 inches in diameter in accordance with ASTM C42.

1. If the concrete in the structure will be dry under service conditions, cores will be air dried (temperature 60° to 80°Fahrenheit, relative humidity less than 60%) for 7 days before the test and the cores will be tested dry.
2. If the concrete in the structure will be more than superficially wet under service conditions, the cores will be tested after moisture conditioning in accordance with ASTM C42.

C. At least 3 representative cores will be taken from each member or area of concrete in place that is considered potentially deficient. The location of cores will be determined by the Landscape Architect so as to least impair the strength of the structure. If, before testing, one or more of the cores shows evidence of having been damaged subsequent to or during removal from the structure, it will be replaced.

D. Concrete in the area represented by a core test will be considered adequate if the average strength of the cores is equal to at least 85% of and if no single core is less than 75% of the specified 28-day strength.

E. Fill core holes using low slump concrete or mortar.

F. Additional testing of materials or concrete occasioned by their failure by test or inspection to meet specification requirements will be paid for by the Contractor.

3.19 RETENTION TESTING

A. Tanks or structures designed to hold or retain water, wastewater or other liquids must be retention tested.

B. To test a tank or structure for leakage, the Contractor will clean, disinfect (if required) and fill the tank or structure with water to its maximum level.

C. The water will be allowed to remain 24 hours with all associated valves and appurtenances tightly closed.

D. During this 24-hour period, the water level (as measured by a hook gauge) will show no measurable loss.

E. If this test fails, the Contractor will dewater the tank or structure, make such repairs as necessary to achieve a watertight tank or structure, clean, disinfect (if required), and retest. This additional testing will be paid for by the Contractor.

F. Tests and repairs will be repeated until the tank or structure is accepted by the Landscape Architect.

3.20 DEFECTIVE CONCRETE

A. If, in the opinion of the Landscape Architect, the defects in the concrete are of such a nature as to warrant condemnation, that portion of the pour may be ordered replaced in its entirety and the Contractor will promptly replace with same without additional compensation.

B. Defective concrete will be repaired by cutting out the defective area and placing new concrete which will be formed with keys, dovetails or anchors to attach it securely in place.

END OF SECTION

SECTION 03 32 00
CONSTRUCTION AND EXPANSION JOINTS

PART 1 GENERAL

1.1 SCOPE OF WORK

A.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A.

1.3 REFERENCE STANDARDS

A. The following is a list of standards and publications referenced in this Section:

1. American Society for Testing and Materials (ASTM) Publications:

a. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

b. ASTM C962 - Guide for Use of Elastomeric Joint Sealants.

c. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

d. ASTM D2628 - Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.

e. ASTM D2835 - Standard Specification for Lubricant for Installation of Preformed Compression Seals in Concrete Pavements.

2. Corps of Engineers (COE):

a. COE CRD-C 572 - Handbook for Concrete and Cement Corps of Engineers Specifications for Polyvinylchloride Waterstop.

3. Journal of the American Concrete Institute, June 1959: Waterstops for Joints in Concrete by B. Kellam and M.T. Loughborough.

1.4 SUBMITTALS

A. Shop Drawings:

1. Product data for materials including location where product is to be used.

2. Certification that materials meet the specifications.

3. Testing laboratory data substantiating results of waterstop zero water leakage tests conforming to test arrangement in the 1959 Journal of the ACI.

4. Manufacturer's application and installation instructions.

5. Samples of waterstops and joint fillers.

6. Color samples or charts for joint compounds.

7. Submit record documents and shop drawings marked to record actual construction.

PART 2 PRODUCTS

2.1 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site in the manufacturer's sealed bags, unopened containers and banded pallets.

B. Store materials off ground on platform or skid supports, and protect with covers from snow, rain and ground splatter.

C. Store plastic products under cover in a dry cool location out of direct sunlight.

2.2 JOINT COMPOUNDS

A. In surface facilities, provide joint compound for joints in horizontal and inclined surfaces less than 30 degrees from the horizontal conforming to ASTM C920, Type S or M, Grade P, Class 25. Provide type T compound in pedestrian and vehicular traffic areas, and type NT in non-vehicular areas. Provide preformed joint seals where indicated.

B. In surface facilities provide joint compound for joints in walls inclined surfaces greater than 30 degrees from the horizontal conforming to ASTM C920, Type S or M, Grade NS, Class 25.

C. Provide compatible joint compounds as recommended by manufacturer when they abut each other.

D. Provide compound made for continuous submergence in liquid containing structures.

E. Provide preformed polychloroprene elastomeric joint seal (compression seal) made of vulcanized elastomeric compound using polychloroprene as the only base polymer. Provide in expansion joints where indicated and conform to ASTM D2628.

F. Provide one-component polychloroprene compound conforming to ASTM D2835 as lubricant for installation of elastomeric joint seal.

2.3 BOND BREAKER FOR JOINT COMPOUNDS

A. Provide polyethylene tape, coated paper, or metal foil.

2.4 BACK-UP MATERIAL FOR JOINT COMPOUNDS

A. Provide 100 percent closed-cell material, compressible, nonshrink, nonreactive with joint compound, and nonabsorbent.

B. Extruded butyl or polychloroprene foam rubber is acceptable.

C. Material impregnated with oil, bitumen, or similar substances is not acceptable.

D. Provide back-up material which is compatible with joint compound as recommended by manufacturer and has same expansion/contraction capability as compound.

2.5 PREMOLDED-JOINT FILLER

A. Provide premolded-joint filler conforming to ASTM D1752, Type I or Type II.

B. Provide joint filler having same thickness as expansion joint width indicated.

C. Provide maximum length filler manufactured to minimize field cutting.

2.6 POLYVINYLCHLORIDE WATERSTOP

A. Provide in accordance with COE CRD-C 572.

B. Provide waterstops of type and size indicated with looped galvanized steel wire along both edges. Manufacture from virgin polyvinyl chloride plastic compound that has a minimum tensile strength of 1750 psi.

C. Provide waterstops having zero water leakage when tested to 50 psi minimum water pressure conforming to test arrangement in the 1959 Journal of the ACI.

D. Provide factory-made and tested crosses, tees, and ells, manufactured using thermostatically controlled electric heat source.

E. PVC waterstops to be manufactured by:

1. Catalog No. RB9-12 as manufactured by Vinylex Corporation, Knoxville, TN.
2. Wirestop Waterstop Part #CR-9380 as manufactured by Paul Murphy Plastics, Roseville, MI.
3. No. 735 as manufactured by Greenstreak Plastic Products Company, St. Louis, MO.
4. Or accepted equivalent product.

F. Provide hydrophilic rubber gasket waterstops as manufactured by:

1. Duroseal Gasket Waterstop manufactured by BBZ USA, Southington, CT;
2. Adeka Ultraseal MC-2010M manufactured by Adeka North America, Spearfish, SD;
3. Swellseal 8 manufactured by de neef Construction Chemicals, Inc., Waller, TX;
4. Approved equal.

2.7 HYDROPHILIC PASTE WATERSTOPS

A. Provide hydrophilic rubber paste waterstops of urethane paste, thixotropic vinyl monomer or similar materials.

B. Ensure hydrophilic rubber paste is compatible with waterstop material.

C. Ensure hydrophilic paste is 100% solids.

D. Provide hydrophilic paste waterstops which meet or exceed the criteria in the following table:

Property	Test Methods	Limit
Ultimate Elongation	ASTM D638	50% minimum
Tensile Strength	ASTM D638	25 psi [170 kPa]
Ozone Resistance	ASTM D1149	No Failure
Volatile Loss	ASTM D1203	0.50% maximum
Hardness, Shore A	ASTM D2240	20 to 60

E. Provide hydrophilic rubber paste as manufactured by:

1. Duroseal Paste manufactured by BBZ USA, Southington, CT:

F. Adeka Ultraseal P-201 manufactured by Adeka North America, Spearfish, SD;

1. Swellseal Cartridge manufactured by De Neef Construction Chemicals, Inc., Waller, TX;

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Do not omit, add, or relocate construction and expansion joints without acceptance of Landscape Architect.

B. Cast slabs and beams monolithically without horizontal joints.

C. Do not use horizontal joints within footings and foundation mats.

D. Place waterstops in joints, in location indicated, before concrete placement.

E. Use factory-made and tested crosses, tees and ells at all corners and intersections where radius is less than 6 inches.

F. Reject before placing concrete, all waterstops bent around corners and remove from the construction or expansion joint and replace with factory-made pieces at no additional cost to Owner.

G. Spark test all waterstop splices before installation in accordance with manufacturer's instructions.

H. Clean expansion joint sidewalls before installing joint compound and compression seals.

3.2 JOINT PREPARATION

A. General:

1. Construct joints to be accurately located and constructed to produce straight joints. They must be vertical or horizontal, except where walls intersect sloping floors.

2. Do not commence the concrete pour until after the joint preparation has been inspected by Landscape Architect.

3.3 PREPARATION OF CONSTRUCTION JOINTS

A. Terminate each day's pour with a construction joint, as shown on the Drawings or as approved by Landscape Architect, and a suitable bulkhead.

B. Maintain on hand, at all times, sufficient keyway material, waterstops, and dowels for emergency use if a construction joint is required due to stoppage of concrete pour because of an emergency shutdown.

C. Temporary stoppage of pouring concrete may result in a cold joint. Prior to resuming concrete placement on this plane, thoroughly clean the surface of all laitance, loose or defective concrete, coatings, sand and other foreign material. Prepare the surface to a sufficient depth to expose sound concrete. Immediately before covering with fresh concrete, wet sandblast the joint, wash it with an air-water jet, and dry the surface.

3.4 CONSTRUCTION JOINTS

A. Prior to placing the abutting concrete, prepare the contact surface according to this Section. Clean all concrete from the exposed portion of the reinforcing steel.

B. Roughen the surface of the hardened concrete by one of the following methods:

1. Sandblasting the foundation and reinforcing dowels after the concrete has fully cured to remove all laitance and spillage, and to expose sound aggregate.

2. Water blasting the foundation and reinforcing dowels after the concrete has partially cured to remove all laitance and spillage, and to expose sound aggregate.

3. Do not allow the roughening process to cause microfractures on the treated surface.

C. At least 2 hours must elapse after depositing concrete in the columns or walls before depositing in beams, girders, or slabs supported thereon. Consider beams, girders, brackets, column capitals, and haunches part of the floor or roof system, and place them monolithically therewith.

D. Furnish key groove with key width one-third the thickness of the member in which the key is placed and a key depth of 1-1/2-inch, unless otherwise indicated.

E. Use tapered key groove forms, with taper being no greater than 2 inches per foot, to permit form removal without damage to groove after concrete has cured.

F. Center waterstops in construction joints unless otherwise indicated.

G. Secure waterstops in position by tie wire from loops to adjacent reinforcement every 12 inches along each edge both sides.

H. Consolidate concrete during placement adjacent to key groove and around waterstop.

I. Do not remove key groove forms until after concrete has been cured for 24 hours.

J. Key groove forms left in place are not acceptable.

K. Clean key groove of laitance, curing compound, foreign materials, protrusions of hardened concrete, roughen and blow out debris and dust with oil-free compressed air.

L. Protect exposed key groove from damage.

3.5 EXPANSION JOINTS

A. Provide expansion joints as indicated.

B. Center waterstops in expansion joints unless otherwise indicated.

C. Secure waterstops in position by tie wire form loops to adjacent reinforcement every 12 inches along each edge both sides.

D. Consolidate concrete during placement adjacent to expansion joint and around waterstop.

3.6 POLYVINYLCHLORIDE WATERSTOPS

A. Provide waterstops in continuous lengths to minimize field splices.

B. Bending waterstops in forms is not permitted. Use factory-made and tested crosses, tees and ells at all corners and intersections where radius is less than 6 inches.

C. Split waterstops are not permitted.

D. Make all splices on a bench following manufacturer's splicing procedures and instructions.

E. Maintain continuity through splice of characteristic features of waterstop cross-section, including ribs and center bulb.

F. Remove looped steel wire along both edges of waterstop adjacent to saw-cut ends prior to splicing.

G. Make splices by heat sealing adjacent surfaces using a thermostatically controlled electric heat source in accordance with manufacturer's printed instructions.

H. Reform waterstop at splices using a remolding iron having pattern matching waterstop.

I. After splice has cooled, spark test all splices in accordance with manufacturer's printed instructions. If splice shows any separation or lack of fusion reject the splice, recut back at least one inch from rejected splice each side, reweld and retest.

J. Position and tie waterstop to form a continuous, watertight diaphragm in joint, to prevent leakage.

K. Support and protect waterstop.

L. Replace or repair, in accordance with manufacturer's printed instructions, damaged or punctured waterstop.

M. Clean waterstop of curing compound, foreign materials, and protrusions of hardened concrete.

N. Consolidate concrete during placement adjacent to waterstop.

O. Maintain 2 inches minimum clearance between waterstop and reinforcement, and all embedded items.

3.7 PREMOLDED-JOINT FILLER

A. Treat cut surface as recommended by manufacturer, when strips are cut.

B. Place against the bulkhead form and fasten to the inside of the form with non-corrodible fasteners.

C. Prevent disturbance of or damage to joint filler.

D. Fill expansion joint completely.

E. Secure wood strips to surfaces which are to receive joint compound.

F. Use tapered wood strips with the smaller width being the same width as the expansion joint and of depth to install the joint compound and back-up materials as recommended by manufacturer.

G. Use materials to secure joint filler and wood strips which will not harm concrete or affect the joint compound's bond to concrete.

H. Do not remove wood strips until after the concrete curing period.

I. Clean groove of laitance, curing compound, foreign materials, protrusions of hardened concrete; blow out dust with oil-free compressed air.

3.8 JOINT COMPOUND

A. Seal, clean and dry concrete in accordance with manufacturer's printed instructions.

B. Install back-up and bond breaker materials to prevent 3 sided bending.

C. Prime concrete, fill flush with joint compound of required thickness, tool to concave joint and seal, all in accordance with the manufacturer's instructions, and ASTM C962.

D. Prevent spilling compound over adjoining surfaces. Use tape adjacent to joint if required. Remove all tape completely from concrete surface.

E. Do not seal when compound, air, or concrete temperature is less than 40 Fahreheit.

3.9 PREFORMED ELASTOMERIC JOINT SEAL

A. Remove joint fillers as recommended by manufacturer for installation of compression seal.

B. Sandblast without damaging, the exposed joint faces until the surfaces are free of dust, dirt, curing compound, joint filler, and any other material that might prevent readily inserting and bonding of the joint seal to the concrete or stainless steel.

C. Clean and dry expansion joints. The atmospheric and pavement temperatures must be above 40 F at the time of joint seal installation.

D. After final cleaning and immediately prior to joint seal installation, blow-out the expansion joints with oil-free compressed air and leave completely free of sand and water.

E. Lubricate and install the joint seal in accordance with the manufacturer's printed instructions.

F. Install the joint seal in the upright position and free form twisting, distortion and stretching that exceeds 5 percent. Install the joint seal to a depth of 3/16-inch, ±1/16-inch, from the finished surface.

G. Make butt joints and intersecting splices with full contact. Use adhesive recommended by the seal manufacturer. Remove all dust, grease, or substances impeding the formation of the seal.

H. When rain interrupts sealing operations, reclean and redry expansion joints prior to installing the joint seal.

I. If joint seals in place fail to meet specified requirements remove them and install new seals at no additional cost to Owner.

3.10 HYDROPHILIC WATERSTOP

A. Use only where specifically shown in the Drawings or approved by Landscape Architect.

B. Install in accordance with the manufacturer’s written instructions.

C. Locate the waterstop within the two curtains of vertical wall reinforcing bars as shown or provide a minimum of 2-1/2 inches of concrete cover over the waterstop.

D. Apply adhesive to concrete surface and allow drying for specified time before applying waterstop strip.

E. Butt ends of waterstop strip together at splices and corners and joins with sealant.

F. For vertical and overhead applications, apply adhesive and secure waterstop with concrete nails as 12-inch maximum spacing.

G. Verify that waterstop is anchored firmly in place before placing concrete. Do not allow vibrator to come into contact with waterstop.

END OF SECTION

SECTION 03 41 00
PRECAST STRUCTURAL CONCRETE

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section includes precast structural concrete as indicated on the Plans complete with product design, manufacture, transportation, erection, and other elated items such as anchorage, bearing pads, storage and protection.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 60 00 - Grouting

1.3 REFERENCE STANDARDS

A. Unless otherwise specified, the Work for this Section must conform to the applicable portions of the following Standard Specifications:

1. AASHTO - American Association of State Highway and Transportation Officials
2. ACI - American Concrete Institute
3. AWS - American Welding Society
4. ASTM - American Society for Testing and Materials
5. PCI - Precast and Prestressed Concrete Institute

1.4 QUALIFICATIONS

A. Manufacturer must be a company specializing in providing precast concrete products and services normally associated with the industry for at least five (5) years. When requested by the Landscape Architect, submit written evidence to show experience, qualifications and adequacy of plant capability and facilities for performance of Contract requirements.

B. The erector must regularly engage in the erection of precast structural concrete, similar to this Project's requirements, for at least five (5) years.

C. Welders must have qualified within the past year in accordance with AWS D1.1.

1.5 DESIGN CRITERIA

A. Submit design calculations by a registered professional engineer, registered in the state where the Work is located, experienced in precast concrete design.

B. Use in the design, applicable codes, ACI 318, or AASHTO Standard Specifications for Highway Bridges. Include in the design loads: all dead and live loads as indicated on the Plans, initial handling and erection stresses, and all other loads specified for members where they are applicable.

C. Watertight Precast reinforced concrete structures are to be designed in accordance with ASTM C890, for A-16(HL-93) loading and installation conditions.

1.6 REFERENCE SPECIFICATIONS

A. All local codes plus the following Specifications, standards and codes are a part of these Specifications:

1. ACI 318 - Building Code Requirements for Reinforced Concrete.
2. AWS D1.1 - Structural Welding Code.
3. AWS D1.4 - Reinforcing Steel Welding Code.
4. AASHTO Standard Specifications for Highway Bridges.

1.7 ALLOWABLE TOLERANCES

A. Design deviations may be permitted only after the Landscape Architect's review of the manufacturer's proposed design supported by complete design calculations and drawings.

B. Provide an installation equivalent to the basic intent of the Work without incurring additional cost to the Owner.

1. Length: +/- 1/8 inch per 10 feet (1 mm per meter), +/- 1/4 inch (5 mm) maximum
2. Cross sectional dimensions:
   a. Less than 24 inches (600 rnm) +/- 1/4 inch, (5 rnm) 24 to 36 inches (600 to 900 rnm): +/- 3/8 inch (9 mm)
   b. Over 36 inches (900 rnm):+/- 1/2 inch (10 rnm)
3. Thickness: +/-1/4 inch (5 mm)
4. Position of anchors and inserts: +/- 1/2 inch (10 mm) of centerline location shown on the Plans.
5. Horizontal alignment or sweep: 1/4 inch (5 mm) total or 1/8 inch per to-foot length (1 mm per meter), whichever is greater. Maximum of ½- inch (10 mm) gap between two (2) adjacent members due to sweep.
6. End squareness: 3/8 inch (9 mm) maximum
7. Blockouts: +/- 1/2 inch (10 mm) off centerline locations shown on the Plans.
8. Out of square: 1/8 inch per six (6) feet (5 rnm per 3 m) measured on the diagonal.
9. Warpage, after installation: 1/8 inch per 6-foot (5nnn per 3 m) length, or 3/8 inch (9 mm), whichever is greater.

C. Vertical Alignment:

   a. Bottom edges of members from line established at lower face: +/- 1/4 inch (5 mm).
   b. Bottom surface from straight line between supports: 1/240 of clear span.

1.8 SOURCE QUALITY CONTROL

A. Comply generally with applicable provisions of Prestressed Concrete Institute MNL-116, Manual for Quality Control for Plants and Production of Precast, Concrete Products.

1.9 SUBMITTALS

A. The Contractor will submit design calculations of products not completed and/or indicated on the Plans, in accordance with the provisions of of this Section.

B. Submit erection or production drawings showing:

1. Drawings and/or elevations locating and defining all material furnished by manufacturer.
2. Sections and details showing connections, cast-in items and their relation to the structure.
3. Description of all loose, cast-in and field hardware.
4. Field installed anchor location drawings.
5. Erection sequences and handling requirements.
6. Elevation view of each member.
7. Sections and details to indicate quantities and position of reinforcing steel, anchors, inserts, etc.
8. Lifting and erection inserts.
9. Dimensions and finishes.
10. Method of transportation.

C. Submit test certificates identifying chemical and physical analysis of materials used for fabrication and physical analysis of the precast product.

1.10 DELIVERY AND HANDLING

A. Perform transportation, site handling, and erection with acceptable equipment, methods, and by qualified personnel.

1.11 STORAGE

A. Store all units off ground.

B. Place stored units so that identification marks are easily discernible.

C. Separate stacked members by battens across full width of each bearing point.

D. Stack so that lifting devices are accessible and undamaged.

E. Do not use upper member of stacked tier as storage area for shorter member or heavy equipment.

1.12 SITE ACCESS

A. Provide suitable access to the building and firm level bearing for the hauling and erection equipment to operate under its own power.

PART 2 PRODUCTS

2.1 PORTLAND CEMENT

A. Must be Type I or Type III: ASTM C150.

2.2 AGGREGATES

A. Lightweight aggregates for concrete: ASTM C330.

B. Fine and coarse aggregate, other than lightweight aggregate: ASTM C33.

2.3 ADMIXTURES

A. Air-entraining admixtures: ASTM C260.

B. Water reducing, retarding, accelerating admixtures: ASTM C494.

2.4 WATER

A. Potable or free from foreign materials in amounts harmful to concrete and embedded steel.

2.5 REINFORCING STEEL

A. Reinforcing bars and wire fabric: Per Section 03 21 00, Concrete Reinforcement.

B. Strand Wire or low relaxation strands: Grade 270K, conforming to uncoated 7-wire stress-relieved strand for prestressed concrete: ASTM A416.

2.6 GROUT

A. Grout: Per Section 03 61 00 - Cementitious Grouting and complying with the following:

1. Cement Grout: One (1) part Portland cement, 2-1/2 parts sand, sufficient water for placement and hydration.

2. Nonshrink Grout: Premixed, packaged nonstaining, nonshrink grout.

2.7 BEARING PADS

A. Use bearing pads of the type recommended by the manufacturer where indicated on the plans.

2.8 WELDED STUDS

A. Must be in accordance with AWS D 1.1.

2.9 CAULKING

A. Must be a nonstaining 1-part polymer acrylic base sealant.

2.10 CONCRETE MIXES

A. Precast: The mixture and mixing must adhere to ACI 304. The resulting concrete needs to achieve a 28-day compressive strength of no less than 5,000 psi (34.4 MPa).

2.11 FABRICATION AND MANUFACTURE

A. Fabricate and manufacture precast products in compliance with the PCI Manual of Practice, and as specified herein.

B. Provide for those openings ten (10) inches (250 mrn) round or square or larger as shown on the Plans. Other openings may be located and field drilled or cut after the precast products have been erected. Obtain the Landscape Architect's approval before drilling or cutting any openings. Do not cut any tension reinforcement.

C. Patching will be acceptable providing the structural adequacy of the product and the appearance are not impaired.

D. The manufacturer must cast in structural inserts, bolts and plates as detailed or required by the Plans or shop drawings.

E. No imperfections, honeycomb, or other defects are permitted. Provide smooth and dense surfaces, free of voids and projections.

F. Fabricate precast reinforced concrete structures in accordance with ASTM C913, to the dimensions indicated on the plans, and the specified design criteria.

2.12 ACCEPTABLE MANUFACTURERS

A. Precast concrete decks are to be manufactured by Price Brothers Company; Concrete Components, Inc.; Precast/Schokbeton; or equal.

B. Precast concrete steps are to be manufactured by Unit Step Company; Michigan Precast Concrete; or equal.

PART 3 EXECUTION

3.1 CONTRACTOR'S VERIFICATION

A. Examine the substrates and conditions under which the precast concrete is to be installed and notify the 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.

3.2 PREPARATION

A. Providing true, level bearing surfaces on all field placed bearing walls and other field placed supporting members.

B. Place and accurately align anchor bolts, plates or dowels in column footings, grade beams and other field placed supporting members.

C. Shoring required for composite beams and slabs must conform to all applicable building codes.

3.3 INSTALLATION - GENERAL

A. Installation of precast prestressed concrete must be performed by the manufacturer or a competent erector subcontracted by the Contractor. Lift members using suitable lifting devices at points provided by the manufacturer. Temporary shoring and bracing, if necessary, must comply with the manufacturer's recommendations.

3.4 ALIGNMENT

A. Align and level members as the Shop Drawings require. Reasonably level out variations between adjacent members by jacking, loading, or any other feasible method recommended by the manufacturer and acceptable to the Landscape Architect.

3.5 FIELD WELDING

A. Field welding is to be done by qualified welders using equipment and materials compatible to the base material.

3.6 GROUTING AND CAULKING

A. After installation of precast units are complete, grout and/or caulk joints as indicated on the Plans or as determined by the Landscape Architect. Completely fill all joints with grout. Remove any grout that seeps through joints and clean surfaces before the grout hardens.

B. Caulking must be used at all underside joints between members and along bearing walls or beams. Concurrently with the caulking and grouting operation, carefully patch any chipped or damaged sections or areas adjacent to openings or otherwise imperfect surfaces, to match the precast surface.

3.7 ATTACHMENTS

A. Subject to the approval of the Landscape Architect, precast prestressed products may be drilled or shot, provided no contact is made with the prestressing steel.

3.8 FIELD QUALITY CONTROL

A. Final inspection and acceptance of erected precast concrete will be made by the Landscape Architect to verify conformance with Plans and Specifications.

3.9 SCHEDULES

A. Precast product quantity, location, surface finish and dimensions must be as indicated on the Plans.

END OF SECTION

SECTION 04 20 00
UNIT MASONRY

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Contractor alone will be fully responsible for the design, strength, safety and adequacy of shoring, bracing and methods of construction, and for the strength, consistency, finish and general quality of masonry.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 04 05 13 - Masonry Mortaring

B. Section 05 50 00 - Metal Fabrications

C. Section 08 10 00 - Hollow Metal Doors and Frames

1.3 SUBMITTALS

A. Product Data:

1. Product data for each different masonry unit, accessory, and other manufactured product indicated.

B. Shop Drawings:

1. Shop drawings for stone trim in form of cutting and setting drawings showing sizes, profiles, and locations of each stone trim unit required.

2. Shop drawings for reinforcing detailing fabrication, bending, and placement of unit masonry reinforcing bars. Comply with ACI 315, Details and Detailing of Concrete Reinforcing, showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of masonry reinforcement.

C. Test Reports:

1. Material test reports from a qualified independent testing laboratory employed and paid by the Contractor indicating and interpreting test results relative to compliance of the following proposed masonry materials with requirements indicated:

a. Mortar complying with property requirements of ASTM C270.

b. Grout mixes. Include description of type and proportions of grout ingredients.

c. Masonry units.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry materials to project in undamaged condition.

B. Store and handle masonry units off the ground, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not place until units are in an air-dried condition.

C. Store cementitious materials off the ground, under cover, and in dry location.

D. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

E. Store masonry accessories including metal items to prevent corrosion and accumulation of dirt and oil.

1.5 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following installed compressive strengths (f'm):

1. For concrete unit masonry: f'm - 1500 psi

1.6 PROJECT CONDITIONS

A. Protection of Masonry: During erection, cover tops of walls, projections, and sill with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

2. Where one wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Remove immediately any grout, mortar, and soil that comes in contact with such masonry.

1. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.

2. Protect sills, ledges, and projections from mortar droppings.

3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes from mortar droppings.

D. Cold-Weather Construction: Comply with referenced unit masonry standard for cold-weather construction and the following:

1. Do not lay masonry units that are wet or frozen.

2. Remove masonry damaged by freezing conditions.

E. Hot-Weather Construction: Comply with referenced unit masonry standard.

PART 2 PRODUCTS

2.1 GENERAL

A. Comply with referenced unit masonry standard and other requirements specified in this Section applicable to each material indicated.

2.2 CONCRETE MASONRY UNITS

A. Comply with requirements indicated below applicable to each form of concrete masonry unit required.

B. Provide special shapes where indicated and as follows:

1. For lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.

2. Square-edged units for outside corners, except where indicated as bullnose.

C. Size: Provide concrete masonry units complying with requirements indicated below for size that are manufactured to specified face dimensions within tolerances specified in the applicable referenced ASTM specification for concrete masonry units.

1. Concrete Masonry Units must be manufactured to specified dimensions of 3/8 inch less than nominal widths by nominal heights by nominal lengths indicated on drawings.

D. Provide Type II, non-moisture-controlled units.

E. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

F. Hollow Load-Bearing Concrete Masonry Units:

1. Standard: ASTM C90.

2. Unit Compressive Strength: Provide units with minimum average net area compressive strength not less than the unit compressive strengths required to produce concrete unit masonry construction of compressive strength indicated.

3. Weight Classification: Lightweight.

G. Solid Load-Bearing Concrete Masonry Units:

1. Standard: ASTM C145.

2. Unit Compressive Strength: Provide units with minimum average net area compressive strength not less than the unit compressive strengths required to produce concrete unit masonry construction of compressive strength indicated.

3. Weight Classification: Lightweight.

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: Comply with ASTM C150. Type I or II; Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce required mortar color.

B. Masonry Cement: Comply with ASTM C91. For colored aggregate mortars use masonry cement of natural color or white as required to produce mortar color indicated.

C. Ready-Mixed Mortar: Cementitious materials, water, and aggregate complying with requirements specified in this article, combined with set-controlling admixtures to produce a ready-mixed mortar complying with ASTM C1142.

D. Hydrated Lime: Comply with ASTM C207, Type S.

E. Aggregate for Mortar: Comply with ASTM C144, except for joints less than 1/4 inch use aggregate graded with 100 percent passing the No. 16 sieve.

F. Aggregate for Grout: Comply with ASTM C404.

G. Water: Clean and potable.

H. Available Products: Subject to compliance with requirements.

2.4 REINFOR

A. General: Provide reinforcing steel complying with requirements of referenced unit masonry standard and this article.

B. Steel Reinforcing Bars:

1. Billet steel complying with ASTM A615.

2. Epoxy-coated billet steel complying with ASTM A 615 and ASTM A775.

C. Deformed Reinforcing Wire: Comply with ASTM A496.

D. Plain Welded Wire Fabric: Comply with ASTM A185.

E. Deformed Welded Wire Fabric: Comply with ASTM A497.

2.5 JOINT REINFORCEMENT

A. General: Provide joint reinforcement complying with requirements of referenced unit masonry standard and this Section, formed from the following:

1. Stainless steel wire, Type 304 complying with ASTM A 580, for exterior walls; and galvanized carbon steel wire, coating class as required by referenced unit masonry standard, for interior walls.

B. Description: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet, with prefabricated corner and tee units, and complying with requirements indicated below:

1. Wire Diameter for Side Rods: 0.1875 inch.

2. Wire Diameter for Cross Rods: 0.1875 inch.

C. Subject to compliance with requirements, provide joint reinforcement by one of the following manufacturers:

1. AA Wire Products Co.

2. Dur-O-Wal, Inc.

3. Heckman Building Products, Inc.

4. Hohmann & Barnard, Inc.

5. Masonry Reinforcing Corp. of America.

6. National Wire Products Industries.

7. Southern Construction Products, Inc.

2.6 TIES AND ANCHORS

A. General: Provide ties and anchors specified in subsequent articles that comply with requirements for metal and size of referenced unit masonry standard and of this article.

B. Galvanized Carbon Steel Wire: ASTM A82, coating class as required by referenced unit masonry standard for application indicated.

C. Galvanized Carbon Steel Wire: Ensure coating class meets the referenced unit masonry standard for wire ties and anchors in interior walls and complies with ASTM A82, unless otherwise indicated.

D. Stainless Steel Wire: Type 304, for wire ties and anchors in exterior walls complying with ASTM A580,

E. Stainless Steel Wire: Type 304 with a diameter of 0.1875 inch and in compliance with ASTM A580,

F. Steel Plates and Bars: Hot-dip galvanized to comply with ASTM A123 or ASTM A153, Class B3, as applicable to size and form indicated.

G. Subject to compliance with requirements, provide products by one of the following manufacturers:

1. AA Wire Products Co.
2. Dur-O-Wal, Inc.
3. Heckman Building Products, Inc.
4. Hohmann & Barnard, Inc.
5. Masonry Reinforcing Corp. of America.
6. National Wire Products Industries.
7. Southern Construction Products, Inc.

2.7 BENT WIRE TIES

A. Contractor will furnish and install individual units prefabricated from bent wire to comply with requirements indicated below:

1. Tie Shape for Hollow Masonry Units Laid with Cells Vertical: Rectangular with closed ends and not less than 4 inches wide.
2. Tie Shape for Solid Masonry Unit Construction: Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long.
3. Type for Masonry Where Coursing Between Wythes Align: Unit ties bent from one piece of wire.
4. Type for Masonry Where Coursing Between Wythes Does Not Align: Adjustable ties composed of two parts, one with pintles, the other with eyes, maximum misalignment 1-1/4 inches.

2.8 MISCELLANEOUS ANCHORS

A. Unit Type Masonry Inserts in Concrete: Cast iron or malleable iron inserts of type and size indicated or required.

B. Dovetail Slots: Furnish dovetail slots, with filler strips, of slot size indicated, fabricated from 0.0336-inch (22-gage) sheet metal.

2.9 POST-INSTALLED ANCHORS

A. Anchors must be capable of sustaining, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E488, conducted by a qualified independent testing laboratory.

1. For cast-in-place and post-installed anchors in concrete, anchors must be capable of sustaining, without failure, a load equal to 4 times loads imposed by masonry.

2. For post-installed anchors in grouted concrete masonry units, anchors must be capable of sustaining, without failure, a load equal to 6 times loads imposed by masonry.

B. Corrosion Protection:

1. Carbon steel components zinc-plated to comply with ASTM B633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).

2. Stainless steel components complying with ASTM F593 and ASTM F594, Group 1 alloy 304 or 316 for bolts and nuts; alloy 304 or 316 for anchor.

2.10 EMBEDDED FLASHING MATERIALS

A. Fabricate sheet metal flashing in accordance with the requirements specified in 07 6000, Flashing and Sheet Metal, and the following:

1. Stainless Steel: 0.0156 inch (28 gage) thick.

B. Vinyl sheet flashing must be flexible sheet flashings especially formulated from virgin polyvinyl chloride with plasticizers and other modifiers to remain flexible and waterproof in concealed masonry applications, black in color and of thickness indicated below:

1. Thickness: 30 mils.

2. Application: Use where flashing is fully concealed in masonry.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

A. Nonmetallic Expansion Joint Strips: Pre-molded filler strips complying with ASTM D1056, Type 2 (closed cell), Class A (cellular rubber and rubber-like materials with specific resistance to petroleum base oils), Grade 1 (compression-deflection range of 2-5 psi), compressible up to 35 percent, of width and thickness indicated, formulated from the following material:

1. Neoprene.

2. Urethane.

3. Polyvinyl chloride.

B. Preformed Control Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall:

1. Styrene-Butadiene Rubber Compound: ASTM D 2000, Designation 2AA-805.

2. Polyvinyl Chloride: ASTM D 2287, General Purpose Grade, Type PVC-65406.

C. Bond Breaker Strips: Asphalt-saturated organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Plastic Weep Hole/Vent: One-piece flexible extrusion manufactured from ultraviolet-resistant polypropylene co-polymer, designed to weep moisture in masonry cavity to exterior, sized to fill head joints with outside face held back 1/8 inch from exterior face of masonry, in color selected from manufacturer's standard.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with requirements for installation tolerances and other specific conditions, and other conditions affecting performance of unit masonry. For the record, prepare a written report listing conditions detrimental to performance of unit masonry.

B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

3.2 INSTALLATION

A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual thickness of the masonry units, using units of nominal thickness indicated.

B. Build chases and recesses as shown or required to accommodate items specified in this and other Sections of the Specifications. Provide not less than 8 inches of masonry between chase or recess and jamb of openings and between adjacent chases and recesses.

C. Leave openings for equipment to be installed before completion of masonry. After installation of equipment, complete masonry to match construction immediately adjacent to the opening.

D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting where possible.

E. Match coursing, bonding, color, and texture of new masonry with existing masonry where indicated.

3.3 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:

1. With full mortar coverage on horizontal and vertical face shells.

2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.

3. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.

B. Cut joints flush for masonry walls to be concealed or to be covered by other materials, unless otherwise indicated.

3.4 HORIZONTAL JOINT REINFORCEMENT

A. General: Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcing a minimum of 6 inches.

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, pipe enclosures, and other special conditions.

3.5 **ANCHORING MASONRY TO STRUCTURAL MEMBERS**

A. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.

B. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.

C. Space anchors as indicated, but not more than 24 inches on center vertically and 36 inches on center horizontally.

3.6 MOVEMENT (CONTROL AND EXPANSION) JOINTS

A. General: Install control and expansion joints in unit masonry where indicated. Build in related items as the masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

B. Form control joints in concrete masonry as follows:

1. Fit bond breaker strips into hollow contour in ends of block units on one side of control joint. Fill the resultant core with grout and rake joints in exposed faces.
2. Install preformed control joint gaskets designed to fit standard sash block.
3. Install special shapes designed for control joints. Install bond breaker strips at joint. Keep head joints free and clear of mortar or rake joint.

C. Form expansion joints in brick made from clay or shale as follows:

1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints, if any.
2. Build flanges of factory-fabricated expansion joint units into masonry.
3. Build in joint fillers where indicated.

4. Form open joint of width indicated but not less than 3/8 inch for installation of sealant and backer rod specified in Division 7 Section "Joint Sealers." Maintain joint free and clear of mortar.

D. Build in horizontal pressure-relieving joints where indicated; construct joints by either leaving an air space or inserting nonmetallic 50 percent compressible joint filler of width required to permit installation of sealant and backer rod specified in Division 7 Section "Joint Sealers." Locate horizontal pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

3.7 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where shown and wherever openings of more than 1'-0" for brick size units and 2'-0" for block size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.8 FLASHING/WEEPING HOLES

A. Install embedded flashing in masonry at shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, in accordance with Section 07 6000.

1. Prepare masonry surfaces so that they are smooth and free from projections that could puncture flashing.

2. Place through-wall flashing on sloping bed of mortar and cover with mortar.

3. Seal penetrations in flashing with adhesive/sealant/tape as recommended by flashing manufacturer before covering with mortar.

4. Install reglets and nailers for flashing and other related construction where shown to be built into masonry.

B. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashings and as follows:

1. Form weep holes with by keeping head joints free and clear of mortar; spacing holes 24 inches on center.

2. In insulated cavities/air spaces cover cavity/air space side of open weep holes with copper or plastic insect screening before placing insulation in cavity.

3.9 INSTALLATION OF REINFORCED UNIT MASONRY

A. General: Install reinforced unit masonry to comply with requirements of referenced unit masonry standard.

B. Temporary Formwork: Construct formwork and shores to support reinforced masonry elements during construction. Construct formwork to conform to shape, line, and dimensions shown. Make sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.

C. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

D. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

3.10 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units and in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing:

1. During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar.

2. Point-up all joints including corners, openings, and adjacent construction to provide a neat, uniform appearance, prepared for application of sealants.

C. Final Cleaning:

1. After mortar is thoroughly set and cured, clean exposed masonry as follows:

a. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

b. Test cleaning methods on sample wall panel; leave 1/2 panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.

c. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.

d. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.

e. Clean brick by means of bucket and brush hand-cleaning method using the following masonry cleaner:

1) Job-mixed detergent solution.

2) Job-mixed acidic solution.

3) Proprietary acidic cleaner; apply in compliance with directions of acidic cleaner manufacturer.

f. Protection: Provide final protection and maintain conditions that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

END OF SECTION

SECTION 26 00 00
GENERAL REQUIREMENTS FOR ELECTRICAL WORK

PART 1 GENERAL

1.1 SUMMARY

A. Work under this Section includes labor, materials, equipment and incidentals required to coordinate the electrical, instrumentation and control (I&C) aspects of the Work to provide a completely integrated and functional system that meets the requirements of applicable specifications, drawings and codes.

B. It is the intent of this Section that equipment and devices, furnished and installed under this and other Sections, be properly connected and interconnected with other equipment so as to render the installations complete for successful operation, regardless of whether the connections and interconnections are specifically mentioned in the Contract Documents.

C. Coordination:

1. Review Contract Documents for electrical work or appurtenances and coordinate the electrical work required by the Project.
2. Review installation procedures under other Sections and coordinate the installation of items that must be installed within or through the work of other contractors.
    a. Provide other contractors and the Landscape Architect with detailed plans or sketches of the location of said conduits and other built-in items as might be required.
    b. Stay informed of construction locations for conduits and other built-in items. Install conduits and built-in items promptly and without delaying the work.
3. Review installation procedures under other Sections and coordinate the work that must be installed with or connected to other equipment, work, and components of instrumentation and control systems. Direct particular attention to coordinating installation requirements for process sensors and meters to be installed in the process piping.
4. Check and coordinate the required electrical service and controls with the actual equipment provided under the Contract Documents.

D. General:

1. Interpretation of Drawings:
    a. Intent:
        1) The Drawings show the principal engineering design elements of the Electrical installation.
        2) The Drawings are not intended as detailed (construction installation) drawings for the Electrical Work, but a complement to the Specifications to clarify principal features of the Electrical System.

b. Submit a complete conduit and wire schedule for conduit and wiring prior to installation as described in the submittals.

1) A preliminary conduit and wire schedule is shown on the Drawings.

2) Verify necessary conduit and wiring with the approved Shop Drawings of equipment in this Contract before submitting a complete conduit and wire schedule.

2. Check with manufacturers regarding the physical sizes of equipment to ensure it fits in the assigned spaces. Instruct manufacturers on the maximum shipping sizes of equipment that can be accommodated during moving from the delivery vehicle through available accesses to the installation space.

3. Connections to existing facilities are included as shown on the Contract Drawings and as required to complete the Electrical work.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02 41 13 - Selective Demolition

B. Section 03 15 00 - Concrete Accessories

C. Section 03 20 00 - Concrete Reinforcing

D. Section 03 30 00 - Cast-in-Place Concrete

E. Section 26 11 16 - Low Voltage Unit Substations

F. Section 26 12 20 - Substaton Transformers

G. Section 26 12 21 - Vacuum Cast Coil Transformers

H. Section 26 13 13 - Medium Voltage Metal-Clad Switchgear

I. Section 26 24 19 - Low Voltage Motor Control Center

J. Section 31 23 16 - Structural Excavation and Backfill

1.3 REFERENCE STANDARDS

A. NEMA, National Electrical Manufacturer’s Association

B. NFPA 70 National Electric Code (NEC)

C. NFPA 70E Standard for Electrical Safety in the Workplace

D. ANSI/IEEE C2 National Electrical Safety Code

1.4 SHOP DRAWINGS

A. Prepare and submit point-to-point interconnection wiring diagrams:

1. Identify all external interconnecting wiring associated with new and modified existing equipment in the diagrams.

2. Develop the diagrams for performance of the Work and to document terminations.

3. Include the following in the point-to-point interconnection wiring diagrams:

a. Wiring and conduit numbers

b. Terminal strip numbers for each wire termination.

c. Color coding

d. Raceways and boxes in which wiring is to be located.

e. Location, and functional name of items to which wiring is connected.

4. Use information obtained from approved Shop Drawings, record drawings and field inspections as necessary to complete the diagrams.

B. Submit conduit and wire layout drawings showing the location, elevation and size of conduits, boxes, and other electrical equipment, and the number, size, and use of conductors and conduit numbers from the Schedule provided herein.

1. Update these drawings during construction and finalize them as record drawings at the conclusion of the Contract.

2. Conduit stub-ups and entrances for the actual equipment provided.

3. Conduits, inserts and other items to be embedded in the concrete, or built into walls, partitions, ceilings, or structural panels.

4. Other built-in items as may be required.

5. Show terminal boxes and fabricated pull and junction boxes, including:

a. Tabulation of locations and dimensions.

b. Bills of Materials.

c. Details of terminal box internals including:

1) Subpanel.

2) Terminal block layout.

3) Grounding provisions.

1.5 QUALITY ASSURANCE

A. Install material and equipment according to the current standards and recommendations of the National Electrical Code and state and local codes. Apply the most restrictive regulation where discrepancies arise between codes.

B. Use new material and equipment.

C. Use electrical material and equipment that bear the label of Underwriters' Laboratories, Inc., or another nationally-recognized, independent testing laboratory wherever standards have been established and label service regularly applies, unless waived in writing by the Landscape Architect.

D. Qualifications: Ensure Contractor is certified by the State of Michigan and licensed by the City of Detroit to perform electrical work.

1. Certification: Qualification Certificate for Electrical Contractor as issued by the _____.

E. Regulatory Requirements:

1. Obtain permits required to commence work and, upon completion, deliver a Certificate of Inspection and Approval from the State Board of Fire Underwriters or other authority having jurisdiction to the Landscape Architect. Pay fees and costs associated with securing required certificates, permits, approvals, and licenses.
2. Perform work related to electrical service and utility metering in strict conformance with the Contract Documents and the requirements of the _____, _____.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Check with manufacturers for the physical sizes of equipment to ensure it fits through accesses and into assigned spaces. Instruct manufacturers on the maximum shipping sizes of equipment that can be accommodated.

B. Store equipment and material in a dry, covered location protected from the weather.

C. Store equipment containing electronic or control devices, such as motor control centers, instruments, and control panels, in a conditioned space protected from weather and corrosive agents.

1. Provide temporary heating for equipment for prevention of condensation.

1.7 PROJECT/SITE CONDITIONS

A. Existing Conditions: Examine the site(s) and existing facilities and compare them with the Contract Documents regarding the conditions of the premises, location and connection of existing facilities, and possible obstructions. Conduct work to minimize disruption to existing conditions.

B. Area Classifications:

1. Conditioned Space Locations:

a. Use materials, equipment, and incidentals in conditioned space areas that meet NEC and NEMA requirements for dusty locations. Treat conditioned space areas as dry locations. Install enclosures in conditioned space locations that meet NEMA 12 requirements.

b. As indicated on Drawings.

2. Hazardous Locations:

a. Use materials, equipment, and incidentals in hazardous areas that meet NEC and NEMA requirements for Class 1, Division 1 classification.

b. As indicated on Drawings.

3. Wet Locations:

a. Use materials, equipment, and incidentals in wet areas that meet NEC and NEMA requirements for wet locations. Install enclosures in wet locations that meet NEMA 4X requirements and use Type 316 stainless steel.

4. Corrosive Locations:

a. Use materials, equipment, and incidentals in corrosive areas that meet NEC and NEMA requirements for corrosive locations. Install enclosures in corrosive locations that meet NEMA 4X requirements and use Type 316 stainless steel.

b. Designate areas not specified above or indicated on the Drawings as "Conditioned Space," "Wet," or "Hazardous" as "Corrosive."

1.8 SYSTEM STARTUP

A. Provide factory-trained service and maintenance technicians as needed to assist in the checkout, start-up, calibration, and testing of major electrical system components. Assume responsibility for system start-up.

B. For specific requirements refer to the referenced Division 26, Electrical. A list of the sections which require site visits from factory trained personnel includes, but is not necessarily limited to:

1. Section 26 11 16 - Low Voltage Unit Substations
2. Section 26 12 20 - Substaton Transformers
3. Section 26 12 21 - Vacuum Cast Coil Transformers
4. Section 26 13 13 - Medium Voltage Metal-Clad Switchgear
5. Section 26 24 19 - Low Voltage Motor Control Center

C. Notify the Landscape Architect seven (7) days prior to startup of major electrical system components.

PART 2 PRODUCTS

2.1 SOURCE QUALITY CONTROL

A. Witnessed Factory Testing:

1. Some of the specification sections contain factory testing requirements which will be witnessed by the Landscape Architect. For specific testing requirements refer to the referenced Division 26 section(s). A list of the sections which require Witnessed Factory Testing for Division 26, include, but are not necessarily limited to:

a. Section 26 11 16 - Low Voltage Unit Substations

b. Section 26 12 20 - Substaton Transformers

c. Section 26 13 13 - Medium Voltage Metal-Clad Switchgear

d. Section 26 24 19 - Low Voltage Motor Control Center

2. When a unit has passed witnessed factory test, parts from the unit may not be removed or replaced.

PART 3 EXECUTION

3.1 PREPARATION

A. Existing Conduit Location and Temporary Wiring:

1. Existing Conduit Location:

a. In existing structures where electrical conduit is embedded in concrete, it will be the responsibility of the Contractor, under this Section, to use x-ray inspection to attempt to locate and mark the existence of conduit embedded in areas where, as part of this Contract, the concrete is to be drilled or cut into for any purpose.

b. Replace or repair electrical conduit, wiring, equipment, or components damaged during this Contract to like-new condition in accordance with Division 26, Electrical requirements.

3.2 INSTALLATION

A. Provide a 4-inch concrete equipment pad under the equipment.

1. Extend the concrete pad 2 inches beyond the outline of the enclosure and provide 1-inch chamfered edges.

2. Provide equipment anchoring per manufacturer's recommendations.

3. Comply with Sections 03 15 00, 03 20 00, and 03 30 00 for construction of the equipment pad.

B. Install material and equipment according to the current standards and recommendations of NFPA 70, National Electrical Safety Code, state codes, local codes, and other applicable codes or standards listed in Division 1, General Requirements. Apply the most restrictive regulation where discrepancies arise between codes or standards.

C. Contractor is responsible for the installation of conduits, inserts and other items to be concealed or embedded in concrete, walls, partitions, ceilings, or any other architectural or structural structures.

1. Coordinate conduit stub-ups and entrances with the actual equipment installed. Provide detailed drawings or sketches of the proposed locations of conduits and other built-in items as required for coordination of the Work.

2. Stay fully informed of construction progress where conduits and other built-in items are to be installed. Install conduits and other built-in items in a manner and within time periods that avoid interference with the Work.

D. Recognize equipment sizes and locations shown on the Contract Documents as estimates. Before installing any wire or conduit, obtain exact equipment requirements, including wire and conduit entrance locations. Install wire, conduit, disconnect switches, motor starters, overload heaters, circuit breakers, or other items of the correct size and location for the equipment actually installed. Treat wire and conduit sizes shown on Contract Documents as minimums and do not reduce them.

E. Notify the Landscape Architect in writing of any interference between electrical equipment shown on the drawings and other equipment. Obtain Landscape Architect approval for proposed changes before making them.

F. Follow equipment lockout/tagout in strict accordance with Owner's requirements and comply with NFPA 70E.

G. Conform excavation, fill, and backfill for exterior electrical equipment or materials to Section 31 23 16 - Structural Excavation and Backfill.

H. Construct electrical duct banks, lighting pole foundations, encasement of buried conduits, and electrical equipment pads under Division 26, Electrical in accordance with Sections 03 15 00, 03 20 00, and 03 30 00.

I. Conduit Locations at Enclosures:

1. Install conduits to enter the bottoms of enclosures. Prohibit entry into the top or side of any equipment enclosure, except for pull and junction boxes containing no live or exposed parts.

3.3 RE-INSTALLATION

A. Provide relocation or modification of any existing electrical, instrumentation, or control systems' wiring, conduit, equipment, or appurtenances necessary to install new piping or equipment under this Project or to perform any other Work included under this Project.

B. Reuse existing wiring where indicated in the Contract Documents. When reusing existing wiring, bring it into conformance with the requirements of Division 26, Electrical, including labeling, terminations, and testing.

C. Check, schedule, and coordinate all relocations or modifications to existing electrical, instrumentation, or control systems' wiring, conduit, equipment, or appurtenances as necessary to install new piping or equipment or perform other Work included under the Project.

D. Removal and Relocation of Existing Electrical Apparatus:

1. Remove and store or relocate all existing electrical apparatus as shown on the Drawings, as specified herein, or as necessary for Contract completion.

2. Remove existing feeder wiring where existing electrical equipment, including lighting fixtures, is shown to be removed.

a. Extend wiring removal to the branch disconnect or to the next piece of utilization equipment.

b. Where new or existing equipment is to be reinstalled, the wiring may be temporarily disconnected.

c. Include in wiring removal the wire, accessible conduit, conduit supports and fittings, exposed junction and pull boxes, and other ancillary materials. Patch and restore resulting holes in remaining existing structures in accordance with Section 02 41 13.

3. De-energize the circuit only long enough to disconnect the equipment and terminate the wiring that is to remain when part of the existing equipment on a branch circuit is to be disconnected.

4. De-energize the circuit only long enough to disconnect the equipment and terminate the remaining wiring when part of the existing equipment on a branch circuit is to be disconnected.

5. Coordinate interruptions of existing circuits with the Landscape Architect, who will determine the allowable duration for de-energizing a circuit to maintain dependable and safe operation of the treatment process.

6. Leave equipment designated “Turn over to Owner” as the property of the Owner unless shown or directed otherwise. Place the equipment in storage on the Plant Site as directed by the Landscape Architect. Refer also to Section 02 41 13.
7. Take ownership of wiring that is retired and removed, and remove it from the job site.
8. Remove electrical wiring, conduit, boxes, and related equipment completely back to the branch circuit protection or motor control center under Division 26, Electrical, when pumps, motors, or other apparatus are removed under other Sections of the Contract. Refer also to 02 41 13.
9. Include removal of accessories incidental to major units when removing equipment. Remove accessible conduit and boxes back to the point of origin where wiring is removed from them.
10. Ensure no piece of electrical equipment remains installed at Contract completion unless it is in service or otherwise directed.
11. Cut electrical conduits embedded in walls or slabs flush with the surface when wires, wiring devices, fixtures, or other apparatus are removed. Plug the conduits with masonry to a smooth surface. Cover boxes and other appurtenances with approved Type 316 stainless steel cover plates.
12. Temporarily support electrical equipment or components attached to materials or equipment being removed during demolition. Provide proper and permanent support before Contract completion. Ensure supports meet applicable requirements of Division 26.
13. Replace or repair electrical equipment or components damaged during this Contract to a like-new condition in accordance with Division 26 requirements.

END OF SECTION

SECTION 26 05 00
ELECTRICAL GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 SCOPE OF WORK

A. The specifications of Division 26 and the accompanying drawings contemplate the furnishing and installation of materials, equipment, supplies, testing, adjustments, labor, and supervision required for the complete performance of operations relating to the electrical and instrumentation.

B. Contractor will be held responsible for the complete and satisfactory accomplishment of Work inclusive of whatever miscellaneous material and/or appurtenances are required to perfect the installation and demonstrate that electrical systems will operate satisfactorily under normal operating conditions.

C. Contractor will be responsible for all electrical connections to equipment. Electrical connections in addition to making wire connections must include, but not be limited to, furnishing, installing, and testing circuit protection devices, motor overload devices, conduits, and fittings needed to ensure a complete and operable electrical installation.

1.2 **RESPONSIBILITY**

A. It will be the responsibility of Contractor to furnish a complete and fully operating system. Contractor will be responsible for all details which may be necessary to properly install, adjust, and place in operation the complete installation. Contractor will assume full responsibility for additional costs which may result from unauthorized deviations from the Plans and Specifications.

1.3 **APPORTIONMENT OF THE WORK**

A. Classify and apportion materials and performance of labor to the several trades involved in accordance with all local customs, rules, regulations, jurisdiction awards, decisions, etc., insofar as they may apply and as required to efficiently execute the Work involved in this Contract.

1.4 **COOPERATION OF THE CONTRACTOR**

A. Contractor must coordinate the work of Subcontractors of each trade to avoid interference in the Work and to avoid delays in the construction. Contractor must coordinate the Work of all Subcontractors to obtain a first-class workmanlike system.

B. Where interference occurs as a result of poor cooperation between Subcontractors and the coordination on the part of Contractor, Owner reserves the right to change the Work in hand to resolve the interferences and such changes will not be considered as extras.

1.5 **DAMAGE TO OTHER WORK**

A. Contractor will be held responsible for damage done by his workmen. Patching and repairing of damaged Work will be done by Contractor.

1.6 **MAINTENANCE PRIOR TO FINAL ACCEPTANCE**

A. Contractor will be responsible for the maintenance of equipment and systems installed until final acceptance by Owner and must take such measures as necessary to ensure adequate protection of equipment and materials during delivery, storage, installation, start up, temporary operation, and shut down.

1.7 **ACCESSIBILITY**

A. Install equipment to allow ready access for operation, maintenance, and repair, subject to the approval of Landscape Architect.

1.8 **CUTTING AND PATCHING**

A. Perform all cutting and patching necessary for the installation of the Work.

B. Do not make major wall penetrations without the written consent of Landscape Architect unless they are called for on the construction drawings.

C. Do not cut, weld, or alter structural steel in any way without the written consent of the Landscape Architect.

1.9 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 30 00 - Cast-in-Place Concrete

B. Section 26 05 10 - Basic Electrical Materials and Methods

1.10 REFERENCE STANDARDS

A. Unless otherwise specified, conform the Work of this Section to the applicable portions of the following Standard Specifications:

1. ANSI - The American National Standards Institute
2. ASA - Acoustical Society of America
3. ASTM - The American Society for Testing Materials
4. ETL - Electrical Testing Laboratories
5. IEEE - The Institute of Electrical and Electronic Engineers
6. ICEA - The Insulated Cable Engineers Association
7. ISA - The Instrument Society of America
8. ITL - Independent Testing Laboratories
9. JIC - Joint Industrial Conference
10. NACE - National Association of Corrosion Engineers
11. NEC - The National Electric Code
12. NEMA - The National Electrical Manufacturers Association
13. NESC - The National Electrical Safety Code
14. NFPI - The National Fire Protection Institute
15. OSHA - Federal Occupational Safety and Health Act
16. UL - Underwriters Laboratories, Inc.

17. FM - Factory Mutual Insurance Underwriters

1.11 SUBMITTALS

A. Schedule:

1. Submit a schedule to the Landscape Architect for review. Outline the steps to maintain electrical service and show the coordination efforts planned between the various trades.

B. Samples:

1. When directed by the Landscape Architect or required by the Specifications, submit samples of materials and accessory equipment. This includes items like lighting fixtures, switches, and receptacles.

2. Do not use these materials in the Work until the Landscape Architect has had ample time to determine product suitability and compliance with Specifications. In general, allow two weeks for the Landscape Architect to approve or reject submitted samples.

C. Shop Drawings and Product Data:

1. Submit shop drawings and product data as required in Section 01 33 00.

2. Submit the following types of information for Landscape Architect approval before installing any equipment:

a. Catalog Cuts and/or Product Data Sheets:

1) Provide catalog cuts for standard manufactured items. This includes conduit and conduit fittings, electric heaters, lighting fixtures, lighting panels, instruments, motors, switches, transformers, wire, etc.

2) Identify the exact equipment for which each sheet is intended.

3) Indicate all pertinent information. This includes physical dimensions, current rating, horsepower, kilowatt rating, phase, power factor, voltage, NEMA classifications, and material type.

4) Show approved listings such as the UL label or other testing agencies.

b. Vendors Standard Drawings:

1) Submit full-size standard drawings for approval. Include the following information on the drawings:

a) Identity of equipment for which drawing is intended.

b) Optional features to be used for this Project identified.

c) Field connections clearly identified complete with necessary terminal and wire numbers.

d) Write the sequence of operation on the drawing unless the control diagram is easily understood without it.

c. Process Control Drawings:

1) Submit wiring diagrams of each piece of equipment, termination cabinet, starter, switch, relay, indicator, controller, recorder, annunciator, telemetering equipment, etc.

2) Include a border, title block, symbols, etc., as used on the Contract drawings and approved by Landscape Architect.

3) Conform ladder diagrams and wiring diagrams to JIC format. Include line numbers, item numbers, power source, terminal numbers, and wire numbers, etc.

4) Assign wire numbers and item numbers using the line numbers on the ladder diagrams.

d. Test Rep

1) When directed, submit the manufacturer's test reports on any equipment proposed for this Project.

2) Contractor will maintain a complete set of test records covering all tests required by this Specification. The records will include the date, equipment or system tested, testing conditions, test results, and Contractor verification.

e. Certificates:

1) Upon completing your portion of the Project, secure and present to the Landscape Architect a certificate of inspection and approval from the department having jurisdiction over the work, if issued. Pay all fees connected with these requirements.

f. Operation and Maintenance Data:

1) Provide maintenance manuals as required in Section 01 33 00 for the main switchgear, motor control centers and reduced voltage starters, and the main control/instrumentation panels.

g. Record Drawings:

1) Provide all drawings pertaining to the Work. Include both manufacturer's drawings and engineer design drawings in reproducible media. Electronic record drawings are acceptable when approved by Landscape Architect.

2) The drawing set mujst include:

a) A site plan and floor plans of each elevation showing the location of all equipment, lighting fixtures, embedded conduit, grounding, conduit size, conduit routing, wire size, etc.

b) Schematic ladder diagrams for each piece of equipment and system using JIC format.

c) Wiring diagrams of each piece of equipment, termination cabinet, starter, switch, relay, indicator, controller, recorder, annunciator, telemetering equipment, etc.

h. Accurately maintain the set of drawings. Submit prints at various stages of the Work, upon the Landscape Architect's request. Turn over final revised record drawings to the Landscape Architect upon completion or termination of Contractor's responsibility to this Contract.

1.12 DELIVERY, STORAGE AND HANDLING

A. Storage:

1. Store electrical equipment and materials in a location and manner to protect against damage.

B. Delivery and Handling:

1. Deliver, unload, and handle materials and equipment in a manner that protects against damage. Repair or replace all damaged or defective material at the Landscape Architect's option and at no cost to the Owner or Landscape Architect.

1.13 PROJECT CONDITIONS

A. Existing Conditions:

1. Determine existing conditions when electrical work begins. Arrange for surveys, trenching, concrete work, conduit sleeves, and any other work necessary to perform the electrical installation.

B. Environmental Requirements:

1. Exercise caution during installation and afterward to assure all equipment is protected from adverse environmental conditions such as temperature, wind velocity, humidity, rain, ice, etc.

C. Protection of Work and Property:

1. Properly protect and keep clean all materials and equipment both before and after erection.

2. Cap, plug, or properly cover conduit ends and unconnected equipment parts to prevent the intrusion of foreign matter.

3. The use of tarpaulins or plastic sheets for temporary enclosures, protection of materials, etc., will not be permitted in areas where burning and/or welding operations are going on or in any location where there may be the slightest hazard of their use contributing to a fire.

4. Replace or repair any equipment that gets damaged after installation, at the Landscape Architect's discretion and the Contractor's expense.

D. Sequencing:

1. Schedule Work to avoid delaying other trades. Supply sleeves, supports, anchors, hangers, and other items for inclusion in other trades' work, and provide positioning information.

PART 2 PRODUCTS

2.1 MATERIALS

A. Material and equipment furnished and installed by Contractor for the permanent Work must be new, unused, of the best quality of make specified, and free from defects of any character. It also needs to be listed as approved by UL and/or FM.

B. Equipment with aluminum buses, aluminum conduits, fittings, supports and conductors are not acceptable.

C. Outdoor electrical equipment must be weatherproof, NEMA 4X (stainless steel), unless otherwise indicated.

D. Unless otherwise specified in other Division 26 sections, coat the sheet metal surfaces of equipment enclosures with a rust-resisting primer.

PART 3 EXECUTION

3.1 GENERAL

A. Installation:

1. Install electrical work according to specified codes and standards, or more stringent requirements if indicated. Verify that materials and equipment properly fit the installation space, with clearances conforming to specified codes and standards, or greater clearance if indicated.

2. Perform work as required to correct improper installations, at no additional cost to Owner.

B. Supervision:

1. In addition to supervision required under the General Conditions, Contractor must assign a competent representative to supervise the electrical construction work from beginning to completion and final acceptance.

C. Inspection:

1. Inspect each item of material and equipment for damage, defects, completeness, and correct operation before installing it. Inspect previously installed related work and verify that it is ready for installation of electrical work.

D. Preparation:

1. Prior to installing electrical work, ensure that installation areas are clean, and maintain them in a broom-clean condition during installation. Clean, condition, and service equipment according to the manufacturer's instructions, approved submittals, and other indicated or specified requirements.

E. Workmanship:

1. Employ skilled craftsmen experienced in installing the specified types of electrical materials and equipment. Use specialized installation tools and equipment as applicable, and produce defect-free installations.

3.2 FIELD QUALITY CONTROL

A. Equipment Start-Up:

1. After installation, the Contractor must test all systems and equipment in the presence of the Landscape Architect under actual operating conditions. These tests need to be performed according to the manufacturer's recommendations.
2. Include the services of all required Equipment Manufacturer's field service technicians with your bid. Their services should cover the period necessary to complete the work to the satisfaction of the Landscape Architect and Owner.
3. This service is for checking out, initial start-up, certification, and instructing plant personnel.
4. A written report covering the technician's findings and installation approval must be submitted to Landscape Architect covering all inspections and outlining in detail any deficiencies noted.
5. Specific requirements, if any, for a particular system or piece of equipment are contained in the particular specification sections. Contractor's responsibility relative to coordinating these services is contained in Section 01 77 00.

B. Manufacturer's Supervision and Field Installation Check:
   1. Where specified, electrical equipment manufacturer must furnish the services of an authorized representative especially trained and experienced in the installation of his equipment to:
      a. Supervise the equipment installation in accordance with the approved submittals and manufacturer's instructions;
      b. Be present when the equipment is first put into operation;
      c. Inspect, check, adjust as necessary, and approve the installation;
      d. Repeat the inspection, checking, and adjusting until all trouble or defects are corrected and the equipment installation and operation are acceptable; and,
      e. Prepare and submit the specified manufacturers' certified report. Include all costs for representative’s services in the contract price.

C. Final Operation Tests:
   1. Test electrical systems for a minimum of 168 hours, allowing interruptions only for normal maintenance or corrective work.
      a. Testing Materials:
         1) Furnish the labor, instruments, recorders, gages, materials, and power for tests as required.
      b. Testing Methods:
         1) Operate systems continuously, 24 hours a day, under the constant inspection of trained operators.
         2) Cause variable speed equipment to cycle through the applicable speed range at a steady rate or change. Induce simulated alarm and distressed operating conditions, and test controls and protective devices for correct operation.

END OF SECTION

SECTION 26 05 10
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Requirements specified in Section 26 05 00 - Electrical General Requirements, are part of this Section. This section forms a part of all other sections of Division 26, unless otherwise indicated.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 33 00 - Submittal Procedures

B. Section 01 77 00 - Closeout Procedures

C. Section 03 30 00 - Cast-in-Place Concrete

D. Section 26 05 00 - Electrical General Requirements

1.3 SUBMITTALS

A. Submit material lists, shop drawings, and factory test reports for the Landscape Architect's approval. Meet all requirements in this section and Section 26 05 00.

B. Operation and Maintenance Manuals: Submit in accordance with requirements of Section 01 77 00 operation and maintenance manuals for items included under this Section.

PART 2 PRODUCTS

2.1 GENERAL

A. Electrical devices furnished under this Contract will be of the most recent manufacture and received at the job site in the manufacturer's shipping container which clearly identifies the item.

B. Only new electrical equipment will be acceptable. Used, rebuilt, or discontinued models will not be accepted for installation under this Contract.

2.2 ACCEPTABLE MANUFACTURERS

A. Only manufacturers recognized as producing new, top quality products meeting applicable standards will be considered acceptable.

B. Landscape Architect may require Contractor to furnish acceptable material from other sources of supply, if he finds the Work will be delayed or adversely affected in any way because the stated source of supply cannot furnish a satisfactory product in sufficient quantities or if it is known to be unsuitable for the purpose for which it is proposed to be used. Contractor has no claim for additional compensation because of such requirement.

2.3 EQUIPMENT AND MATERIALS

A. Disconnect Switches:

1. Provide heavy-duty rated disconnect switches of the types and ratings, as indicated on the Plans. Rate disconnect switches for 120 VAC systems at 240 VAC. Equip

disconnect switches with NEMA 4X stainless steel enclosures and pad-lockable operating handles.

2. Use disconnect switches manufactured by Square D Co., Allen Bradley, or Eaton.

B. Lighting Panels:

1. Provide lighting panels of code gauge steel, of the dead front safety type with single or multi pole circuit breaker branches of the number and size as indicated on the drawings. Ensure lighting panels are NEMA 4X stainless steel. Use copper for the main bus. Include a main circuit breaker as indicated on the drawing and have a 10,000 RMS symmetrical interrupting capacity for 240/120 volt panels. Use Square D "NQOB", G.E. NLAB, or Eaton lighting panels.

C. Wire Size and Insulation (Low Voltage):

1. For branch circuits, including power and lighting, use No. 12 minimum size copper conductors. Ensure conductors are type THHN, THW, XHHW or THWN, insulated with Underwriters' approved 600-volt insulation, and in accordance with the following:

a. Manufacture and test rubber and rubber-like insulated wire and cable in accordance with ICEA Publication No. S-19-81 (latest edition), NEMA Publication No. WC3.

b. Thermoplastic insulated wire and cable must be manufactured and tested in accordance with ICEA Publication No. S-61-402 (latest edition), NEMA Publication WC5.

c. Manufacture and test cross-linked polyethylene insulated wire and cable in accordance with ICEA Publication No. S-66-524 (latest edition), NEMA Publication No. WC7.

d. For indoor lighting branch circuits and 120-volt receptacle circuits, use single conductor solid copper. Ensure 600-volt insulation, Type "THW", "THWN", or "XHHW" moisture and heat resistant thermoplastic approved by N.E.C. for operating temperature of 75°C and for installation in wet or dry locations.

e. Use Type "XHHW" heat resistant wire for wiring recessed fixtures and between fixtures and their adjacent outlets.

f. For 480-volt standard service, use single conductor stranded copper cable. Ensure it has corona, ozone, heat, and moisture-resistant cross-linked polyethylene 600-volt insulation. Rate it to withstand a copper temperature of 90°C without deterioration. Meet applicable ICEA Standards and ensure UL labeled XHHW.

g. Color code wire and cable, including feeders, main, and branch circuits, as follows:

208 / 120 Volt		**480 / 277 Volt**	
Color	**Phase**	**Color**	**Phase**
Black	A	Brown	A

Red	B	Orange	B
Blue	C	Yellow	C
White	Neutral	Gray	Neutral
Green	Ground	Green	Ground

h. For conductors No. 8 and smaller, use color-coded insulation. For conductors No. 6 and larger, tape terminations and conductors in pull boxes with colored tape, at least two inches wide.

i. Ensure wire and cable are continuous in the same color code and type to their extreme termination point. The use of different types of insulated wire to the same device or equipment will not be accepted. Manufacturers must be Anaconda, General Cable, General Electric, Okonite, or Triangle.

D. Control Wiring:

1. Control circuit, single conductor field wire must be No. 14 AWG, stranded copper with 30-mil thick wall of cross-linked polyethylene or polyvinyl chloride insulation rated to withstand a copper temperature of 90 degrees Celsius at 600 volts without deterioration. Ensure it meets applicable ICEA Standards.

2. Multi-conductor control cable must consist of individual conductors, No. 14 AWG, stranded copper with 30-mil thick wall of insulation rated to withstand a copper temperature of 75 degrees without deterioration. Use a 20-mil wall of polyethylene with a 10-mil thick polyvinyl chloride jacket for insulation. Identify individual conductors per Paragraph 5.6.3. of ICEA Publication No. S-61402. Cable them together with suitable fillers and binder tape to create a substantially circular cross-section.

3. Apply an overall sheath of black polyvinyl chloride to the cable. Maintain the following minimum thickness:

No. of Conductors	Jacket Thickness
2 - 5	0.045"
6 - 14	0.060"
15 and above	0.080"

4. Ensure the entire cable meets applicable ICEA Standards and tests for thermoplastic insulated cables.

5. Control wires to be identified with vinyl wire markers.

E. Panel Wiring:

1. Panel wiring must be a minimum 14 AWG-MTW, 60 degrees rated for AC connections.

2. Rate thermoplastic wire covers at 600 volts. Use red for AC wires, light blue for DC wires, and canary yellow for wires interconnecting with other control panels or systems potentially energized from alternate power sources. Use green on all ground wire connections, black for power sources, and white for power neutral.

3. Connect instrument shields to a common ground termination in the control panel. Do not ground shields in the field.
4. Do not splice control or instrument wiring outside of termination points.
5. Identify wires comprising the various control systems for this installation at each termination with wire identification tags.
6. Use numbered tags manufactured from laminated mylar. Ensure they withstand temperatures up to 300 degrees Fahrenheit without deterioration or discoloration.
7. Use "solid" preprinted wire numbers. Do not piece them from single and/or double-digit tags.

F. Shielded Single Pair Cable:

1. For general shielded service, use single-pair cables. Ensure they consist of two twisted conductors, served with a continuous aluminum mylar shield with grounding bleed wire, and protected with an insulating jacket.
2. Individual conductors consist of tinned, soft annealed copper, stranded, insulated with a 24-mil thick wall of polyethylene. Color code and size the twisted pair as follows:
   a. Runs under 400 feet - No. 16 AWG
   b. Over 400 feet - No. 14 AWG

G. Multiple Conductor Shielded Cable:

1. Construct the cable as an assembly of twisted pairs. Cable them together and serve with an overall aluminum mylar shield with grounding bleed wire. Extrude a polyvinyl chloride jacket to the following thickness:

Cable Size	Jacket
3 and 7 pair	60 mils

2. Use portable cords made of flexible, bunch stranded, plain annealed copper conductors. Ensure a 600-volt heat and moisture-resistant rubber insulation, suitable for operation with a 60 degrees Celsius copper temperature. Color code individual conductors for identification. Cable them with suitable high-strength fillers to give the completed cable a circular cross-section.

H. Conduits and Fittings:

1. Manufacture conduits in conformance with the latest published standards of ANSI, ASTM, and UL and must be as follows:
2. Ensure rigid steel conduit, conduit bends, elbows, couplings, and nipples are hot-dipped galvanized. For buried rigid steel conduit, use plastic-coated galvanized steel conduit. Use threaded type couplings and connectors.
3. Use double locknuts and insulated bushings, raintight connectors, or threaded hubs for conduit terminations. Apply as applicable to maintain the enclosure's rating.

4. Make joints in conduits with standard couplings. If neither conduit turns, use an O.Z. Type "SP" split coupling or Erickson coupling. Do not permit running threads.
5. Use O.Z. Type "DX" conduit expansion fittings with bonding jumper, as required.
6. Ensure PVC conduit material has a tensile strength of 7,000 psi at 73.4 degrees Fahrenheit, a flexural strength of 11,000 psi, and a compressive strength of 8,600 psi.
7. Match PVC conduit fittings and covers to the PVC conduit manufacturer.
8. Provide flexible liquid-tight conduit for connections to vibrating or rotating equipment. Use Anaconda Type "UA" for 3/4-inch to 1-1/4 inch and Type "EF" for 1-1/2-inch and larger, flexible conduit, with Appleton STN series fittings, as required.
9. Do not permit flexible steel conduit similar to "Greenfield."

I. Pull Boxes:

1. Provide pull boxes, junction boxes, and cable support boxes. Ensure proper size and design in accordance with the N.E.C. and as required to facilitate wire installation. Size boxes in accordance with the N.E.C. Gasket covers and secure with corrosion-resistant machine screws. Provide cable supports for vertical runs at code-required locations within pull or junction boxes. Use NEMA 12 boxes for inside. Use NEMA 4X for outside where exposed to weather or as indicated on the drawings.

J. Outlet Boxes:

1. Use cast steel outlet boxes for every outlet and switch as called for on the drawings and specified herein. Ensure cast boxes meet the galvanized finish requirements for steel conduits.
2. For exposed work, use cast steel outlet boxes with threaded openings. Type "FS" or “FD” unless noted otherwise.
3. Provide temporary caps on boxes similar to Gedney, "Red Caps" during construction.

K. Receptacles:

1. In general, install duplex convenience grounding type receptacles with weathertight gaskets and covers. Mount these in exposed cast metal conduit boxes, type FD with mounting ears. This applies to receptacles used for disconnects as well.
2. Rate convenience receptacles at 20 amps with back and side wiring. Finish exposed metal parts to resist corrosion.
3. Rate special purpose receptacles at 20 amps, 230 volts, unless otherwise specified on the drawings.
4. Weatherproof duplex receptacles must have a separate spring type cover for each receptacle mounted on a FS or FD box.
5. Provide ground fault circuit interrupting breakers for receptacles in wet wells, kitchens, bathrooms, and as indicated on the drawings.

6. Explosion proof receptacles must be 20 ampere, 2 wire, 3 pole, 120 volts, Killark KRS-215-220 Appleton Crouse-Hinds. Supply one matching plug each.

L. Light Switches:

1. Switches must be "T" rated. Switches, and receptacles must be specification grade and as called for on the drawings.
2. Use stainless steel for covers unless otherwise specified on the drawings.
3. Switch and Receptacle Plates:
4. Plates for switch, receptacles, telephone, and miscellaneous signal outlets must be 0.040 inches stainless steel with No. 4 finish in all areas unless otherwise noted.
5. Install cadmium plated steel plates in equipment spaces and process areas.
6. Mount grouped devices in a single continuous gang plate.

M. Lighting Fixtures:

1. Furnish all materials and equipment required to install and operate all LED fixtures.
2. Complete lighting fixtures, including all lamps and/or tubes, ballasts, fuses, support brackets, and other necessary parts and devices for full operation.
3. Install the lighting fixtures as listed on the Plans. Landscape Architect may approve other manufacturers as acceptable substitutes; follow the "substitutes" requirements in the General Conditions.
4. Provide lighting fixture supports and conduit connections and fittings with corrosion-resistant qualities.
5. Ensure fixtures, signs, etc., carry Underwriters Laboratories, Inc. approval; label them accordingly.

N. Lamps:

1. Furnish and install all lamps for all lighting fixture types as shown on schedules and drawings. Clean fixtures and relamp all lamps at the end of the job.
2. Led lamp color temperature must be, 4000 degrees K. The initial light output must be 3,000 lumens.

O. Ballast:

1. Make ballast an integral part of fixtures as specified on the drawings.
2. Ballasts must be high power factor, non-PCB, E.T.L. certified. Ensure they carry Certified Ballast Manufacturer's and Underwriters Laboratories' labels.

P. Heat Trace System:

1. Provide 120 VAC, 5 watts/ft. heat trace cable, furnished with a heat trace controller and ground-fault protection device (as required per the NEC). Use Chromalox CPR series or equal heat trace cable. Use Chromalox TPR series or equal heat trace controller.

Q. Telephone Box and Handset:

1. Provide a NEMA 4X, surface mount telephone box with a latching door. The telephone box and handset must be manufactured by Hubbell/GAI-Tronics Model 354-001 or equal.

R. Nameplates:

1. Furnish and attach laminated white plastic nameplates with black lettering to safety switches, lighting panels, starter enclosures, and panelboards. Secure with sheet metal screws. Size nameplates 2-1/2-inch wide x 3/4-inch high. Make the first line character size 1/4-inch high and the second line 3/16-inch high. For panel designations, refer to the electrical panel schedule on drawings. Include a typed circuit schedule inside each panelboard cover.

2. Equip field-located instruments and devices with 1" x 3" engraved nameplates (similar to the panelboard nameplates). Affix them to their respective devices using a positive but flexible method (wire strap or other similar means).

2.4 MIXES

A. Mix patches, conduit sealing compound, fire stop compounds, etc., according to manufacturer's recommendations.

2.5 FABRICATION AND MANUFACTURE

A. Contractor shall, to the degree possible, preassemble switchgear, panel boards, motor control centers, control panels, relay panels, etc.

1. Preassembly should be done off site in a clean shop environment by Contractor or manufacturer.

B. Fabricate control panels, motor control centers, and switchgear in sections no longer than 10 feet. Provide jumpers for field connections of bus and interconnecting wiring.

1. Provide panels with adequate lifting eyes.

PART 3 EXECUTION

3.1 VERIFICATION

A. General:

1. Thoroughly field check dimensions that tie mechanical and/or electrical installations to the building structure for accuracy and potential interference from field conditions. Ignorance of such field conditions, due to Contractor's failure to field check the dimensions in question will be no excuse for additional compensation.

B. Surveys:

1. Lay out and establish the lines and grades of all underground conduits on site according to the drawings. Employ a competent surveyor for this work.

2. If unforeseen obstructions occur, confer with the Landscape Architect and obtain his written approval before proceeding with any work deviating from the governing drawings. Contractor will assume full responsibility for locations and grades throughout this portion of the Work.

C. Locations:

1. Field-locate wall outlets, telephone outlets, clock outlets, specialized outlets, fixtures, and equipment rough-ins unless drawings indicate otherwise.

D. Points of Termination:

1. The points of connection and termination of related work under this Division of this Project are indicated on the Plans or stated in the Specifications, but in case of doubt as to such points of connection or termination, the decision of Landscape Architect will be final.

3.2 PREPARATION

A. Keep conduit, fittings, and accessories free of foreign matter. Ream and deburr conduit ends to prevent wire and cable damage.

3.3 INSTALLATION

A. General Requirements:

1. Electrical system layouts indicated on the Plans are generally diagrammatic and locations of outlets and equipment are approximate. Exact routing of conduits and wiring, locations of outlets and equipment will be governed by structural conditions and obstructions. Install equipment requiring maintenance so it remains readily accessible.
2. Do not burn, cut, or drill structural steel for conduit installation without the Landscape Architect's written permission.
3. Install wiring in raceway, including low voltage work, unless shown or specified otherwise.
4. Make minimum conduit size 3/4-inch unless noted otherwise.
5. Conceal conduit installation wherever possible, unless otherwise indicated. In unfinished mechanical equipment rooms where the exact location of ventilation ducts, etc., is not shown, install the conduit exposed and avoid interferences.
6. Separate conduits by at least 12 inches from parallel runs of steam or hot water piping.
7. Use rigid steel conduit for exposed service drops in mechanical equipment and process area rooms and in exposed outdoor areas, unless another raceway type is specified. Use steel or malleable iron locknuts as size requires.
8. Use rigid steel for conduit runs in floor slabs and direct buried underground between structures. Make stub ups rigid steel.
9. Where drawings permit PVC conduit, install underground PVC conduit runs on approved plastic spacers. Encase these runs in a 3-inch granular material envelope with red-oxide pigmented concrete over top. Place a yellow-colored, plastic, detectable caution tape a minimum of 12-inches above the conduit. Label caution tape "Caution – Buried Electrical Lines."
10. Make connections to vibrating or rotating equipment with flexible liquid tight conduit.

11. Provide expansion fittings at all expansion joints and/or where required to compensate for expansion and contraction in long conduit runs. Connectors must be compatible with flexible conduit used.
12. Install conduits in floors and walls wherever possible, unless otherwise indicated on the Plans or specified herein.
13. Empty feeder and riser conduits must contain one No. 10 AWG galvanized steel pull wire. Splicing of the pull wire will not be permitted.
14. Set conduit joints tight. Make runs straight and true. Ensure elbows, offsets, and bends are uniform and symmetrical.
15. Mount multiple exposed conduit runs with rustproofed steel supports. Arrange supports to individually clamp or bolt each conduit. Hot-dip galvanize steel conduit supports after fabrication.
16. Rigidly brace concealed conduits or outlets installed flush in masonry or concrete construction against movement during construction. This ensures accurate termination points.
17. Conduits hidden by suspended ceilings may be run exposed between ceiling construction and structural slab. In service rooms, mechanical equipment rooms, and other work areas where conduits are exposed, rack them in neat, symmetrical lines with proper supports. Run conduits at right angles and parallel to floors, ceilings, and walls.
18. Test underground conduit to confirm all fittings are completely sealed. Perform tests during and after conduit installation, but before pulling cable and before encasing any conduit in concrete.
19. Use factory elbows for 90-degree bends 1-1/4 inches and larger. Make elbows of 3-inch conduit size and larger long radius. Perform field bends without injuring the conduit or effectively reducing its internal diameter. Ensure factory elbows, nipples, and couplings match the conduit type.

B. Conduit Supports:

1. Space and secure conduit supports suitably to provide adequate mechanical support and meet code requirements. Use steel bar, Unistrut, angle, or channel of sufficient size for a firm, rigid support. Hot-dip galvanize fabricated supports and mounting brackets after fabrication and drilling. Allow rod hangers with lateral bracing. Do not drill structural steel flanges of I-beams or channels. Prefabricated sections may be used with approval of Landscape Architect.
2. Substantially secure electrical equipment, including raceways, outlet boxes, panels, and fixtures, to the building structure. Install inserts or insert bolts for electrical equipment support during building construction whenever practical.
3. Install exposed multiple horizontal and vertical parallel runs of conduit. Use galvanized steel framing channels, conduit clamps, and rod hangers where needed. Follow manufacturer's recommendations for carried loads during installation.

4. When exposed isolated conduit requires clamping to flat surfaces, use galvanized malleable iron, one-hole pipe straps for conduit up to and including 1-1/2 inches. For conduits above 1-1/2 inches, use two-hole, extra heavy steel straps. Employ steel bolts of appropriate size to fill the holes of the straps.
5. Support conduit in accordance with N.E.C.

C. Conduit Fittings:

1. Make conduit fittings from a compatible material as the conduit. Include rubber gaskets on conduit fittings with blank covers, except in clean, dry areas. Ensure access to these fittings after Work completion.

D. Sleeves and Inserts:

1. Provide all necessary openings and sleeves on walls and floors for work. Use tapered nut inserts with lead alloy expansive retainer sleeves. Do not use wooden plugs.

E. Lighting:

1. Mount lighting fixtures level at the height indicated on the Plans.

F. Taps and Splices:

1. Make splices and taps with screw type pressure connectors. Spring pressure type connectors may be used for No. 10 AWG conductors and smaller. Make instrument pigtail splices with solderless crimp type connectors.
2. Connect No. 8 wire and larger to switches, panels, and controllers with solderless lugs. Ensure lugs are the proper style and size to handle full wire capacity.
3. Equip stranded cable terminations with solderless lugs.
4. Allow no splices outside of enclosures. Permit no splices except for lighting fixture and instrument pigtail connections unless the Plans specifically indicate them or written approval is given by Landscape Architect.
5. Insulate unsupported and unenclosed joints on terminal strips or equipment lugs with high-quality tape or material in an approved manner.

G. Wiring:

1. Run wiring for power, lighting, telephone, sound, and low voltage control in one of the conduit types described in these Specifications, unless the Plans indicate otherwise.
2. Color code multi-wire branch circuits as stipulated in the National Electrical Code and as herein specified.
3. Install circuits feeding duplicate processing equipment in separate conduits.
4. Run instrumentation cable in conduits to isolate the cable from power or electrical wiring.
5. Do not cut back cable insulation beyond what is reasonably required to make a connection, splice, or termination.

6. Tag wires and cables at both ends and in pull boxes or panel box gutters they pass through.
7. Do not pull conductors into any conduit run before all joints are made up tightly and the entire run rigidly secured in place.
8. Permit approved pulling-in compounds for ease of pulling cables. Ensure cable pulling in no way injures conductors by elongation or to insulation by abrasion, binding, etc. Replace damaged cable.

H. Foundations:

1. Arrange with the Contractor to provide concrete pad foundations for all floor-mounted equipment installed under this Division. Make pads four inches high, unless otherwise noted.

I. Access Panels:

1. Provide access panels or hatches wherever building construction conceals electrical equipment requiring access for inspection, operation, or maintenance. Furnish all such panels required for access to the Work. Install all panels.
2. A subcontractor requiring access panels must confer with Contractor in regard to access panel locations and shall, wherever practicable, group equipment requiring access such that a single panel with serve all and eliminate additional panels.

J. Grounding:

1. Provide all grounding, whether or not shown on the Plans. Ensure all grounding complies with NEC and local codes and ordinances. Understand that grounding shown on the plans represents the minimum acceptable. Group electrical grounding into two (2) classifications as follows: system grounding and equipment grounding.
    a. System:
        1) Do not use metallic conduit, fittings, or piping as a grounding path.
    b. Equipment:
        1) Ground metal or conducting type enclosure frames, raceways, cable trays, conduit, panelboards, substations, motor frames, switches, switch boxes, outlet boxes, junction boxes, lighting fixture frames, building steel, metal siding, rebar, piping, etc. Use a green-colored or bare equipment grounding conductor of the size specified in tables of the most recent applicable N.E.C. edition.
        2) When a separate equipment grounding conductor is used, it must be contained within the same raceway or cable with the circuit conductors.
        3) Use solid cylindrical rods as grounding rods, hereinafter referred to as ground rods. Make them 3/4-inch in diameter and 10 feet in length, or longer, as required to reach the specified resistance. Ensure rods are copper-clad steel, tinned at the top end for connection.
        4) Ensure resistance from the building ground loop to earth does not exceed 2 ohms before connection to the building steel and water system.

5) Do not install bare copper bar, cables, or fittings used for grounding in cinder fill or cover them with soil containing cinders or other corrosive materials. Install cables with enough slack to prevent stresses.

6) Provide sleeves of transit, plastic, fiber, or other approved nonmetallic material where ground conductors pass through floor slabs, building walls, etc., and are not encased in rigid metal conduit as specified elsewhere. Ensure sleeves are the required size, shape, and length unless otherwise specified or indicated on the Plans.

7) Make bonding jumpers from copper with a cross-sectional area at least equal to their corresponding grounding conductors. Where attaching to equipment, conduits, cabinets, etc., use suitable approved solderless lugs, compression connectors, or clamps. Do not use soldered connections on grounding circuits at any point, except where ground conductors attach to lead cable sheaths.

8) Bond grounding mediums together. Include electric, telephone, antenna systems, ground, and underground piping systems that enter the structure.

9) Ensure compression connectors, lugs, etc., used in grounding circuits in any location have bolts, nuts, etc., of silicone bronze alloy metal. Use ground connections, clamps, etc., as manufactured by Burndy Engineering Company, Thomas & Betts Company, or Penn-Union Electric Company.

10) Drive the minimum number, spacing, and location of ground rods per the site soil conditions during dry weather. Make connections to ground rods below finished grade level. Connect them by "cadweld" or other thermal process.

11) Do not use the water system as the grounding electrode. Ground the water system to the grounding system.

12) Make taps and splices in grounding cables by the "cadweld," or equal, process.

13) Provide approved bonding jumpers on conduits running to boxes or cabinets with concentric or eccentric knockouts that partially perforate the metal around the conduit and impair the electrical connection to ground. Ensure jumpers consist of a stranded, braided copper wire at least No. 6 AWG with a solderless lug on each end. Connect the jumper inside the box to a stud or silicone bronze alloy bolt in the cabinet frame.

14) Provide approved bonding jumpers of not less than No. 6 AWG stranded bare copper on conduit expansion joints and telescoping sections of metal raceways not thoroughly bonded otherwise.

K. Electrical Equipment Identification:

1. Label electrical devices in a clear and permanent manner. Identify their electrical circuit.

2. Add the functional description of motor circuits to motor starter panel and distribution panelboard doors, remote safety switches, and manual switches.
3. Identify receptacles and wall switches using the distribution panel "letter designation" and circuit breaker numerical assignment.
4. Attach laminated plastic identification nameplates to motor starters, switchboards, and panelboards with screws as specified. Identify other electrical devices using 1/4-inch plastic adhesive-backed embossed tape securely fastened to the face of the device.

L. Painting and Finishing:

1. Concealed iron work, panel boxes, junction and pull boxes, and support boxes not Give concealed iron work, panel boxes, junction and pull boxes, and support boxes not galvanized one coat of rust-resisting paint inside and out. Additionally, give junction boxes one coat of white enamel inside only.
2. Equipment which was finish painted by the manufacturer or fabricator will remain as is unless paint has become marred or damaged during installation, in which case the equipment will be repainted to its original condition by Contractor.

3.4 FIELD QUALITY CONTROL

A. Requirements of Regulatory Agencies:

1. Ensure materials and equipment for the work and installation conform to all national, state, and local codes, rules, regulations, and ordinances. Secure all permits, inspections, and tests required in connection with this portion of the Project.

B. Tests:

1. After apparatus and wiring installation is complete, test all electrical conductors. Ensure continuity, proper phasing, correct splicing, freedom from unwanted grounds, and adequate insulation values.
2. Use a 1,000-volt hand-driven megger on all 600-volt insulated service conductors. A 500-volt hand-driven megger may be used on all lower voltage insulated service conductors. Isolate conductors from other equipment during tests. Test each cable until it reaches a constant value for 15 seconds.
3. Apply megger and high potential tests of multiple conductor cables between one conductor and ground. Connect all other conductors to the same ground. Test each conductor in like manner.
4. Replace wiring not measuring up to minimum ICEA field testing standards.
5. Minimum acceptable reading is 100 megohms for 600 volt insulated service conductors and 1.0 megohms for lower voltage insulated services such as instrumentation cables.
6. Make tests with lightning arrestors removed and disconnections made at points of final termination.

7. Check motor rotation with the motor mechanically disconnected from the equipment to be driven; this prevents damage to the equipment. Ensure motor rotation is as directed by the equipment manufacturer. Cooperate with the manufacturer to check its accuracy.
8. Do not test the equipment unless it is sufficiently lubricated.
    a. Testing on Grounding:
        1) Inspect ground conductors and connections for conformance with design specifications and for satisfactory workmanship.
        2) Test resistance to earth of each ground rod and each ground grid.
        3) Test ground paths for equipment and structural steel grounding.
    b. Maintain each ground rod isolated from the associated ground grid for tests on individual rods for resistance to earth.
    c. Include associated ground rods and interconnecting wiring in tests on each grid system for resistance to earth.
    d. Include ground bus on equipment, grid connection, and associated intermediate copper ground conductors in tests on ground paths for electrical equipment.
    e. Include structural steel connection, grid connection and intermediate conductor in tests on ground paths for structural steel.
    f. Test each ground rod for resistance to earth by a standard method. Use a Biddle ground tester or the method of using two auxiliary ground rods as described in IEEE Standard No. 550, paragraph 3.42. The IEEE method requires the use of AC test current. Place auxiliary test rods sufficiently far away from the rod under test so that the regions in which their resistance is localized do not overlap. Calculate ground resistance from the readings taken. Maximum acceptable resistance to earth at each ground rod: 25 ohms.
    g. If the resistance is found to be higher than 25 ohms, drive additional rods with a minimum separation of 10 feet and connect in parallel with the rod under test until 25 ohms or less is obtained, or increase the length of the rod under test until 25 ohms maximum is obtained.
    h. Test each isolated ground grid as specified for individual ground rods, except the maximum acceptable resistance to earth is five ohms. In tests on total ground systems, the maximum acceptable resistance to earth is two ohms.
    i. Test ground paths for electrical equipment and structural steel for continuity by applying a low voltage DC source of current, capable of furnishing up to 100 amperes. The ground path for electrical equipment using structural steel must conduct 100 amperes. Resistance as calculated from the current and voltage must not exceed 0.010 ohms.
    j. Grounding materials and connections must pass all inspections and must meet all specified maximum and minimum values.

k. Make complete records of all tests. Include resistance values obtained, calculations of same, and methods of test and calculation.

9. Send notice of tests to be performed to the Landscape Architect and Owner before tests are made.

10. Furnish duplicate certified records of all insulation tests to the Landscape Architect.

3.5 ADJUSTING AND CLEANING

A. Adjustments:

1. Contractor is responsible for making all necessary equipment and instrument adjustments to ensure a complete and safe working system under normal operating conditions.

a. Equipment to be adjusted will include, but not limited to, ground fault circuit interrupters, circuit breaker trip settings, motor starter overload settings, thermostats, pressure switches, level switches, limit switches, control instruments, etc.

b. Provide a coordination study of the electrical system.

B. Manufacturer's Services:

1. Services of a factory trained, qualified service representative of the equipment manufacturer must be provided by Contractor to inspect the complete equipment installation to ensure that it is installed in accordance with the manufacturer's recommendations, make all adjustments necessary to place the system in trouble-free operation, and instruct the operating personnel in the proper care and operation of the equipment furnished. This will be required for the main switch gear/motor control center, main control panel including all instrumentation and any other major equipment.

C. Cleaning and Finishing:

1. Before turning the systems over to Owner, clean all fixtures, equipment, exposed metal surfaces, and leave all in clean condition at the end of the Work as specified elsewhere in the Contract Documents.

D. Final Inspection:

1. Upon completion of the Work, Contractor must conduct a complete inspection of all items of Work and make whatever corrections and adjustments are deemed necessary to a well functioning system that will meet with the satisfaction of Landscape Architect and Owner.

END OF SECTION

SECTION 26 05 44
ELECTRICAL HANDHOLES AND MANHOLES

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, materials, equipment and incidentals required to provide handholes and manholes as shown on the Drawings, specified or required.

B. Related Sections:

1. Section 03 20 00 - Concrete Reinforcing
2. Section 03 30 00 - Cast-in-Place Concrete
3. Section 26 05 26 - Grounding Systems
4. Section 31 23 16 - Structural Excavation and Backfill

1.2 REFERENCES

A. Reference Standards

1. ASTM A48/A48M, Standard Specification for Gray Iron Castings.
2. ASTM A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
3. ASTM C858, Specification for Underground Precast Concrete Utility Structures.
4. ASTM C1028, Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
5. ANSI/SCTE 77 , Specification for Underground Enclosure Integrity.

1.3 DEFINITIONS

A. Manhole as used in these specifications refers to both handholes and manholes.

1.4 SUBMITTALS

A. Shop Drawings:

1. Manhole layout drawings including plans, elevations, sections, details of openings, inserts and reinforcing and bills of materials.
2. Manhole grounding system layout including bill of material.

B. Product Data: Copies of manufacturer’s specifications and technical information for manhole components and accessories proposed for use.

C. Project Record Documents:

1. Include the actual locations of manholes, along with coordinates, elevations, and dimensions, on the Project Record Documents.
2. Submit results of ground test.

1.5 QUALITY ASSURANCE

A. Qualifications

1. Manufacturer Qualifications: Manufacturers need a minimum of five (5) years experience producing materials and equipment similar to what we specify here. They must also have a record of successful in-service performance. If the Landscape Architect asks, provide a list of satisfactory installations.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manholes and Handholes:

1. Hartford Concrete Products, Inc.
2. Or Landscape Architect approved equal.

B. Small Handholes (not to exceed 36 inches in either width or length):

1. Hubbell/Lenoir City, Inc./Quazite.
2. Or Landscape Architect approved equal.

2.2 MATERIALS

A. Manholes:

1. Coordinate manhole widths and depths with the duct bank penetrations. Size manhole interior dimensions to accept the largest duct bank penetration. Ensure a 1-foot minimum undisturbed sidewall on both sides of the duct bank penetration. Manhole depth varies with duct bank depth. Minimum dimensions are as shown on the drawings.
2. Material: Choose precast or cast-in-place reinforced concrete for manholes. For reinforcement, follow Section 03 20 00 - Concrete Reinforcing. For cast-in-place concrete, adhere to Section 03 30 00 - Cast-in-Place Concrete.
3. Minimum interior dimensions as shown.
4. Provide a 12-inch by 12-inch by 6-inch deep sump in the manhole floor. Center the sump in the manhole floor directly under the lid except as otherwise shown on the Drawings.
5. Precast Manholes:
    a. Unless specified otherwise, use precast manhole components consisting of reinforced concrete sections. Design these sections specifically for manhole construction and manufacture them according to ASTM C858, except as modified herein.
    b. Manufacture precast, reinforced concrete manhole bases, riser sections, flat slabs, and other components using wet cast methods only. Use forms that provide smooth surfaces, free from irregularities, honeycombing, or other imperfections.
    c. Construct manhole joints with a tongue and groove type. Employ a single, continuous rubber O-ring gasket. Extend the circumferential and longitudinal

steel reinforcement into the bell and spigot ends of the joint without breaking the continuity of the steel.

1) Create joints between the rectangular base sections, riser sections, and top slabs of manholes using rubber and concrete joints.

2) For manholes 72 inches in diameter and less, create joints between circular base sections, riser sections, and top slabs using rubber and concrete joints.

3) For circular manhole components over 72 inches in diameter, provide joints with steel bell and spigot rings.

d. Ensure precast manhole components have sufficient strength to withstand imposed loads. Design them for a minimum earth cover loading of 130 pounds per cubic foot (pcf), an H-20 wheel loading, and an allowance of 30% for impact in roadways and 15% in rights-of-way.

1) Manhole bases require two (2) cages of reinforcing steel in their walls. Each cage must have an area equal to that required in the riser sections. Ensure a wall thickness of at least five (5) inches.

2) Ensure concrete top slabs measure at least eight (8) inches thick.

e. If using lifting holes, make them tapered and cast no more than two (2) in each section. Provide tapered, solid rubber plugs to seal these holes. Design the lifting holes so plugs can be driven from the outside face of the section only.

f. Mark the point of intersection (P.I.) of the duct bank centerlines. Use a 1/4-inch diameter steel pin, firmly enclose it in the floor of each manhole base, and make it protrude approximately one (1) inch above the finished floor of the base.

g. Mark date of manufacture and name or trademark of manufacturer on inside of the manhole barrel.

h. Construct the manhole barrel using various lengths of riser sections. Manufacture these sections in increments of one (1) foot to provide the correct height with the fewest joints. Openings in the barrel of the manholes for ductbanks or other penetrations are not allowed closer than one (1) foot from the nearest joint. Provide special manhole base or riser sections as needed to meet this requirement.

i. Provide a precast or cast-in-place slab or a precast eccentric cone, as shown or approved, at the top of the manhole to receive the frame and cover.

B. Components and Accessories:

1. Ensure all hot-dip galvanized components comply with ASTM A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

2. Manhole frames and covers must conform to ASTM A48/A48M, Class 30, gray iron. Ensure types and sizes match the Plans. Castings must be neatly made, free from cracks, cold sheets, holes, and other defects. Grind casting surfaces to ensure proper fit and prevent rocking.

a. Covers: Watertight, sealed type marked "Electrical" in raised 2 inch letters.

b. Grout the frame on the manhole.

3. Pulling Irons:
   a. Use hot-dip galvanized steel.
   b. Provide at least one pulling iron opposite each duct bank entrance. Cast it into the wall and integrate it with the reinforcing steel.
   c. Manufacturers:
      1) MacLean Power Systems
      2) Cooper
      3) Or Landscape Architect approved equal
4. Cable Racks:
   a. Use hot-dip galvanized steel.
   b. Adequately support cables and provide space for future cables.
   c. Assemble each rack as a vertical assembly of 24-inch cable racks. Extend them from within six (6) inches of the manhole roof slab to within 6 inches of the manhole floor.
   d. Products and Manufacturers:
      1) MacLean Power Systems, Cat. No. J-5125
      2) Cooper, Cat. No. DU17B3
      3) Or Landscape Architect approved equal
5. Cable Hooks:
   a. Use hot-dip galvanized steel.
   b. Ensure the length is at least 7 1/2 inches.
   c. Products and Manufacturers:
      1) MacLean Power Systems, Cat. No. J-5132
      2) Cooper, Cat. No. DU4S2
      3) Or Landscape Architect approved equal
6. Insulators:
   a. Use porcelain.
   b. Products and Manufacturers:
      1) MacLean Power Systems, Model No. J-5122
      2) Cooper, Cat. No. DE17U1
      3) Or Landscape Architect approved equal
7. Manhole Steps:

a. Use stainless steel
b. Adequately support 600 pounds
c. Choose a drop front design
d. Products and manufacturers:
1) Insesco 12B30
2) Or Landscape Architect approved equal

8. Duct terminator modules:
a. Provide where shown on drawings
b. Made of high impact, high strength ABS plastic
c. Interlock modules and seal them together using the recommended plastic solvent cement to provide a panel of openingsthat matches the duct bank configuration.
d. Match the inside to outside wall dimensions to the manhole wall dimensions.
e. Taper the coupling area of the terminator to facilitate duct entry. The inside diameter of the terminator opening must accommodate the outside diameter of the duct it terminates.
f. Bell interior openings.
g. Include watertight membrane
h. Products and manufacturers:
1) Formex Manufacturing Inc.
2) Or Landscape Architect approved equal.

C. Small Handholes (not to exceed 36 inches in either width or length):
1. Material: Precast Polymer concrete.
2. Duct entrances sized and located to suit duct banks.
3. Enclosures and covers must be UL listed.
4. Enclosures, boxes, and covers are required to conform to test provisions of ANSI/SCTE 77 for Tier 15 applications.
5. All covers are required to have a minimum coefficient of friction of 0.50 in accordance with ASTM C1028.

2.3 ACCESSORIES

A. Cable Ties:
1. Non-metallic 3/4-inch strapping tape or nylon straps.
2. Manufacturers:
a. 3M Company
b. Or Landscape Architect approved equal

B. Cable Clamps:

1. Use hot-dip galvanized steel.
2. Manufacturers:
   a. Hubbell/A.B. Chance Company
   b. Or Landscape Architect approved equal

2.4 FABRICATION

A. Tie pulling irons to concrete reinforcement during manhole fabrication.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide electrical handholes and manholes as shown on the Drawings and specified. Verify final locations in field. Perform excavation and backfilling required for installation. Perform excavation and backfilling per Section 31 23 16 - Structural Excavation and Backfill.

B. Install manholes on a crushed stone foundation as shown. If not shown, provide select backfill of crushed stone at least six (6) inches deep. Set manhole bases at the proper grade. Carefully level and align them.

C. Precast Manholes:

1. Set sections vertical. Align steps and sections truly. Butter the base of the bell or groove end at component joints with a 1 to 2 proportion cement-sand mortar. This provides uniform bearing. Seal joints with cement mortar inside and out. Trowel smooth to the wall surface contour. Do not allow raised or rough joint finishes.
2. Install sections, joints, and gaskets in accordance with manufacturer’s recommendations.
3. Seal lifting holes tight with a solid rubber plug. Drive the plug into the hole from the barrel's outside. Fill the remaining void with a 1 to 2 cement-sand mortar.

D. Grounding: Provide the following in accordance with Section 26 05 26 - Grounding Systems:

1. Install a ground rod for each manhole. Make grounding and bonding connections accessible. Bond all exposed metal manhole accessories and the concrete reinforcing rods. Use a 4 AWG minimum, 7 strand, annealed, tinned, bare copper wire for this. Connect the wire to the ground rod.
2. Install a 4/0 AWG minimum, 19 strand, annealed, tinned, bare copper grounding conductor around the inside perimeter of the manhole as follows:
   a. Form a loop with the manhole grounding conductor. Bond both ends to the ground rod.
   b. Attach the manhole grounding conductor loop to the manhole walls within 6 six inches of the bottom. Use cable clamps with clamp back spacers. Locate these

clamps within three inches of each corner and space them no more than three feet apart along each wall.

1) Anchor clamps with 316 stainless steel anchors.

3. Bond underground duct bank grounding conductor(s) directly to the manhole grounding conductor loop.
4. Perform ground rod connections and all connections to the manhole grounding conductor loop using exothermically welded connections. Meet the requirements of Section 26 05 26 - Grounding Systems.

E. Cable Racks:

1. Attach cable racks using Type 316 stainless steel anchors.
2. Provide cable hooks to support each cable on each rack along the cable run within manholes.
3. Support each cable individually at each hook on porcelain insulators.
4. Securely tie each cable in place at each insulator block. This prevents excessive movement of insulators, cables, or fireproof tape.

a. Tie cables with non-metallic 3/4-inch strapping tape or nylon straps.

F. Complete installation of manholes and handholes so that structures are watertight. Apply foam sealant to all penetrations.

G. Provide grade rings for manholes when required to adjust cover to proper grade. Construct the grading ring on the roof slab or cone section. Place the manhole frame and cover on this ring. The ring's height must bring the frame to the proper grade, but do not exceed twelve (12) inches in height.

H. Grading at Manholes

1. Build manholes in unpaved areas as shown or directed by the Landscape Architect, to a rim elevation higher than the original ground. Grade the ground surface to drain away from the manhole. Place fill around manholes to the level of the manhole frame's upper rim. Grade the surface evenly on a 1 to 5 slope to the surrounding ground, unless otherwise shown or directed by the Landscape Architect.
2. Construct manholes in paved areas to meet the final surface grade. In paved areas on state highways, place manholes 1/2 inch below final wearing surfaces. Do not allow manholes to project above finished roadway pavements.
3. Contractor bears sole responsibility for achieving the proper height of all manholes to reach the final grade. Landscape Architect’s review of Shop Drawings for manhole components is general in nature and Contractor must provide random length precast manhole riser sections to adjust manholes to meet field conditions for final grading.

3.2 FIELD QUALITY CONTROL

A. Perform testing of ground system as specified in Section 26 05 26 - Grounding Systems.

B. Manhole Watertightness

1. Keep manholes free of visible leakage, such as water streaks. Inspect each manhole. Repair all leaks in a manner subject to Landscape Architect's approval.

END OF SECTION

SECTION 26 05 53
ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, materials, equipment, and incidentals to provide wire labels, wire color coding, terminal block labels, conduit identification, legend plates, nameplates and other identification for all electrical apparatus as shown on the Drawings, specified or required.

B. Related Sections:

1. Section 26 00 00 - General Requirements for Electrical Work
2. Section 26 05 13 - Medium Voltage Cables - 5 KV and 15 KV
3. Section 26 05 19 - Low Voltage Cable and Wire - 600V and Less
4. Section
5. Section 26 05 73 - Short-Circuit Coordination Study
6. Section 40 63 00 - Control System Equipment
7. Section 40 90 00 - Process Instrumentation, Controls and Monitoring Equipment - General Requirements

1.2 REFERENCE STANDARDS

A. NFPA 70, National Electric Code (NEC):

1. Voltage System Identification
2. Arc-Flash Safety Signs for Switchboards, Panelboards, Motor Control Centers, and Industrial Control Panels

1.3 SUBMITTALS

A. Shop Drawings: Show the complete description and enumeration of proposed electrical-identification-nomenclature text and electrical-identification devices on the Shop Drawings for associated equipment or systems.

B. Product Data: Manufacturer’s cut sheets, specifications, dimensions and technical data for all products proposed to be furnished under this Section.

C. Samples:

1. Nameplates: Submit nameplate samples for the Landscape Architect's selection of size and lettering style.
2. Submit wire and cable label samples. Include both applied and unapplied wire and cable label samples. Use these samples as quality standards for the wire and cable labeling this Section requires. These samples must use material specified in this Section. They must also include wire and cable designators meeting the requirements of this Section.

D. Commissioning Documents: Submit point-to-point wiring diagrams annotated with wire numbers and terminal numbers prior to commissioning of associated equipment or systems.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

A. Engraved Identification Devices (Nameplates and Legend Plates):

1. Nameplates:

a. Phenolic plastic, 1/16 inch thick, engraved condensed block black lettering on white background, square corners, and beveled front edges.

b. Size: As required.

c. Letter Size: Minimum 3/16 inch.

d. Drill nameplates 1 inch or less in height with one mounting hole at each end. For nameplates greater than 1 inch in height, drill mounting holes in all 4 corners.

2. Legend Plates:

a. Use large legend plates for pushbuttons, pilot lights, selector switches, and other panel mounted devices. Provide dimensions of approximately 2 7/16 inches wide by 2 13/32 inches tall (Allen Bradley large automotive size). Construct them from phenolic plastic and custom engrave them with black letters on a white background.

1) Provide standard size legend plates only where mounting devices on motor control centers. Use them when device spacing precludes using automotive size legend plates.

b. Match lettering size and line weight for all legend plates on the same panel or enclosure. The minimum size must be 3/16 inch.

B. Safety Signs and Voltage Markers:

1. Install high voltage safety signs. Unless otherwise shown or specified, make them a minimum of 10 inches high by 14 inches wide. Construct them from fiberglass reinforced plastic. Ensure they conform to OSHA standards. The signs must resist fading from exposure to temperature extremes, ultraviolet light, abrasive, and corrosive environments. Word them: "DANGER - HIGH VOLTAGE - KEEP OUT."

a. Use Type 316 stainless steel for all mounting hardware.

b. Products and Manufacturers:

1) B-120-45471 by Brady

2) Landscape Architect approved equal

2. High voltage safety signs for installation on indoor equipment may be pressure sensitive acrylic or vinyl a minimum of 10 inches high by 14 inches wide. Ensure

they conform to OSHA. Word them: "DANGER - HIGH VOLTAGE - KEEP OUT."

a. Products and Manufacturers:

1) B-302-84084 by Brady

2) Landscape Architect approved equal

3. Install cable tray safety signs. Use pressure-sensitive vinyl conforming to OSHA. Make them 5 inches by 3 1/2 inches. Word them: "DANGER - HIGH VOLTAGE."

a. Products and Manufacturers:

1) B-302-84084 by Brady

2) Landscape Architect approved equal

4. Install low voltage safety signs. Use pressure-sensitive vinyl conforming to OSHA. Make them 5 inches by 3 1/2 inches. Word them: "DANGER - 480 VOLTS."

a. Products and Manufacturers:

1) 86783 by Brady

2) Landscape Architect approved equal

5. Low voltage markers must be pressure sensitive vinyl or vinyl cloth with black lettering on orange background. Word them: "120 VOLTS," "208 VOLTS," "120/208 VOLTS," or "240 VOLTS" as required.

C. Conduit Labels:

1. Use pre-tensioned acrylic/vinyl construction coiled to completely encircle conduit diameters through 5 inches or pre-molded to conform to circumference of 6-inch conduit.

2. Attach strap-on style markers for 6-inch conduit with stainless steel springs.

3. Must be blank for use with custom printed labels.

4. Custom labels:

a. Must have black lettering on yellow background.

b. Must not contain abbreviations in legend.

c. Must be custom printed on continuous tape with permanent adhesive using thermal printer specified below.

D. Wire Identification:

1. Heat Shrinkable Wire and Cable Labeling System:

a. Use white heat-shrinkable irradiated polyolefin shrink-on sleeves. Thermal print the labels. Make labels at least 2 inches wide.

2. Wrap-Around Wire and Cable Labeling System:

a. Self laminating white/transparent self extinguishing vinyl strips. Ensure the label length provides at least 2 1/2 wraps. Thermally print labels. Make labels at least 2 inches in width.

E. Detectable Underground Warning Tape:

1. Must be polyethylene or polyester with detectable metal core and polyester underlaminate.
2. Must be 6 inches wide.
3. Must be red with permanently imprinted black lettering: "CAUTION - Buried Electric Line Below", repeated continuously over full length of tape.
4. Products and Manufacturers:
   a. Indentoline by Brady.
   b. Landscape Architect approved equal

F. Thermal Printing System:

1. Utilize a thermal transfer process for the printing system. This creates non-smearing labels and markers.
2. Use the "Microsoft Sans Serif" font or a similar Sans Serif font for the system.
3. Print labels with an 8 point minimum font size.
4. Wire and Cable Markers:
   a. Portable:
      1) TLS2200 by Brady.
      2) Landscape Architect approved equal
   b. Desktop:
      1) 200M by Brady.
      2) Landscape Architect approved equal
5. Cable Markers:
   a. Portable:
      1) Handimark by Brady.
      2) Landscape Architect approved equal
   b. Desktop:
      1) Labelizer PLUS by Brady.
      2) Landscape Architect approved equal

G. Voltage System Identification Directories:

1. General

a. Directories must be laminated phenolic plastic, 1/16 inch thick, engraved block black letters on white background, square corners, and beveled front edges.

b. Directories must identify all voltage systems within the building.

c. Directories must list the colors that identify ungrounded and grounded conductors of each system.

d. Colors must be per Section 26 05 19 - Low Voltage Cable and Wire - 600V and Less, and Section 26 05 13 - Medium Voltage Cables - 5 KV and 15 KV.

e. Example Directory Text:

Voltage System Identification Color		
System Voltage	**A, B, C, Leg Colors**	**Neutral Color**
277/480	Brown, Purple, Yellow	Gray
120/208	Black, Blue Red	White

H. Arc-flash Safety Signs:

1. Warning signs must be adhesive-backed polyester, orange with black lettering, minimum of 4 inches by 6 inches.

2. Warning sign must be titled “Warning- Arc Flash and Shock Hazard- Appropriate PPE Required.”

3. Warning sign must be custom printed and contain the following specific information for each equipment item:

a. Equipment Name

b. Cal/cm2

c. Category (PPE)

d. Glove Class

e. Restricted Approach Limits

f. Limited Approach Limits

4. Products and manufacturers:

a. Brady

b. Landscape Architect approved equal

I. Electrical Hazard Signs:

1. Pictograph symbol of a triangle enclosing a lightning bolt, red on yellow background, 3 inches by 3 inches of polyester material.

a. Brady #89152

b. Landscape Architect approved equal

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide electrical identification as shown, specified, or required.

B. Engraved Identification Devices (Nameplates, Annunciator Windows and Legend Plates):

1. Unless otherwise specified, attach permanent nameplates with a permanent adhesive and with stainless steel machine screws into drilled and tapped holes.
2. Provide a nameplate with 1 1/2-inch letters to identify each console, cabinet, panel, or enclosure as shown or specified.
3. Provide nameplates for field-mounted motor starters, disconnect switches, manual starter switches, pushbutton stations, and similar equipment operating components. These nameplates must describe the motor or equipment function and the circuit number.
4. Provide nameplates with 1/2-inch letters to identify each junction and terminal box as shown or specified.
5. Furnish nameplates for all main and feeder circuits on switchgear. This includes control fuses, indicating lights, and instruments.
    a. Provide a nameplate with 1 1/2-inch letters. Include the switchgear designation, voltage rating, ampere rating, short circuit rating, manufacturer's name, general order number, and item number.
    b. Identify each individual compartment door with a nameplate. This nameplate should include the item designation, circuit number, frame ampere size, and the appropriate trip rating.
    c. Provide labeling in the form of a mimic bus to the exterior of the switchgear enclosure.
6. Motor Control Centers:
    a. Provide a nameplate with 1 1/2-inch letters to indicate the motor control center designation.
    b. The individual door for each unit compartment mbe identified with a nameplate identifying the controlled equipment.
7. All electrical appurtenances, with the exception of conduit, must have nameplates. This includes, but isn't limited to, lighting panels, convenience outlets, fixtures, and lighting switches. These nameplates should clearly indicate the appropriate circuit breaker number(s).
8. Push Buttons:
    a. Provide legend plates for identification of functions.
    b. Provide nameplates for the identification of controlled equipment.
    c. Provide red buttons for the stop function.
    d. Provide black buttons for other functions.

9. Pilot Lights:
    a. Provide legend plates for identification of functions.
    b. Provide nameplates for identification of controlled equipment.
    c. Provide lens colors as shown or specified. If no color is indicated, use the following:

Color	Status
Green	Running / Open
Red	Stopped / Closed
Amber	Alarm
Blue	Motion
White	Power / Status / Automatic

10. Selector Switches:
    a. Provide legend plates for identification of functions.
    b. Provide nameplates for identification of controlled equipment.
11. Panel Mounted Instruments: Provide nameplates for identification of function.
12. Interiors of Cabinets, Consoles, Panels, Terminal Boxes and Other Enclosures:
    a. Provide nameplates for identification.
    b. Each item inside the cabinet, console, panel, terminal box, or enclosure must have a laminated plastic nameplate. These nameplates should be as shown on the conforming shop drawings and mounted with adhesive.
    c. Interior items requiring nameplates include but are not limited to:
        1) Terminal blocks and strips
        2) Bus bars
        3) Relays
        4) Rear of face-mounted items
        5) Rear of door-mounted items
        6) Any interior mounted item which requires identification when mounted externally.
    d. Circuit Breaker Directory: Provide an engraved laminated plastic directory. List the function and controlled load for each circuit breaker within the panel used for power distribution.

C. Safety Signs and Voltage Markers:
1. Provide safety signs and voltage markers on and around electrical equipment as specified and where shown.

a. Install rigid safety signs using stainless steel fasteners.

b. Clean surfaces before applying pressure-sensitive signs and markers.

2. Mount high voltage safety signs on all equipment doors providing access to uninsulated conductors (including terminal devices) greater than 600 V.

3. Install cable tray safety signs on both sides at each end and every 20 feet. Omit labels on sides where the tray is within 24 inches of a wall or where it runs on the same plane and parallel with another cable tray, within 24 inches, and only for the length where the trays run parallel and the side is hidden. Install them on the side rails of the tray as directed and accepted by the Landscape Architect.

a. Label cable trays containing conductors greater than 600 V with cable tray safety signs.

b. Label cable trays containing conductors greater than 208 V but less than 600 V with low voltage safety signs.

c. Label cable trays containing 120/208 V conductors with low voltage markers.

d. Do not label cable trays that contain only instrument signal cables.

e. Label cable trays that contain intrinsically safe wiring or cables per NEC requirements.

4. Mount low voltage safety signs on all equipment doors providing access to uninsulated 480 V conductors (including terminal devices).

5. Install low voltage markers on each terminal box, safety disconnect switch, and panelboard. This applies to those installed, modified, or relocated and containing 120/208 V conductors.

D. Conduit Labels:

1. Label all conduit unless otherwise specified.

2. Do not label flexible conduit.

3. Conduit labels must convey the following information:

a. Contract Number: Alphanumeric, 3 or 4 digits, as applicable.

b. Conduit Number: Alphanumeric, 3 to 5 digits; and must be a unique combination for each conduit, as shown on the Drawings and in accordance with conforming submittals.

4. For conduits containing intrinsically safe wiring, install an additional pipe marker. This marker must have blue letters on a white background and read: "INTRINSICALLY SAFE WIRING."

a. Install intrinsically safe pipe markers per NEC along the entire installation. Spacing between labels must not exceed 25 feet.

5. Install conduit labels at the following locations:

a. Where conduit enters or exits walls, ceilings, floors or slabs.

b. Where conduit enters or exits boxes, cabinets, consoles, panels or enclosures, except pull boxes and conduit bodies used for pull boxes.

c. Every 50 feet along exposed runs.

6. Orient conduit labels so they are readable.

E. Wire and Cable Identification:

1. Color code insulated conductors; comply with Section 26 05 19.

2. Provide wire and cable labels as follows:

a. Label all new, rerouted, or revised wire or cable.

b. Label all insulated conductors.

c. Do not label bare (uninsulated) conductors unless otherwise shown or specified.

d. Use heat shrink labels wherever a wire or cable terminates.

e. Label wire and cable terminations.

1) Apply wire labels 1 inch from the completed termination. Ensure 1 inch of insulation remains visible between the completed termination and the label.

2) Apply cable labels 1 inch from the cable breakout into individual conductors.

a) Label individual conductors in a cable after breakout, as specified for wires.

f. Label wires or cables within 2 inches of the entrance to any conduit.

g. Label wire and cable every 36 inches along its length wherever it is not in conduit.

h. Label wire and cable installed in cable trays.

1) At 20-foot maximum intervals.

i. Label wire and cable installed without termination in electrical manholes with wrap-around labels. Apply these labels within 1 foot of exiting the manhole.

3. Wire and Cable Identification System:

a. Imprint wire and cable labels with an identifying designator.

1) Identify wires and cables extending between 2 devices or items that do not change function with a single, unique designator as specified below.

b. Field Wiring:

1) Derive field wiring designators from the layout of the interconnecting drawings. Interconnecting drawings are specified in Section 26 00 00.

2) The wire or cable designator must consist of:

a) The first grouping of three or four characters must consist of the Contract Number under which the wiring is installed.

b) The next character mustbe an asterisk (*) as a separator.

c) The next group of four characters must be numeric and refer to the page of the field wiring diagram where the wire originates.

d) The next character must be a dash (-) as a separator.

e) The next group of three or four characters must be alphanumeric and refer to the terminal number on the field wiring diagram where the wire originates.

(1) If a wire connects to two panel terminals with different numbers, its designation must become two groups of three or four characters separated by a slash (/).

f) If multiple wires would have duplicate numbers based on a) through e) above, then utilize a three character group consisting of a number bracketed by parenthesizes. Increment this number to make each wire designation unique.

g) Where applicable, attach a functional suffix from the list below to the wire number.

Suffix	Purpose
GND	Wire is a ground wire
L1, L2, L3	Power feed to a circuit (1,2,3 refer to phase connection)
T1, T2, T3	Power connection to a motor (1,2,3 refer to phase connection)

h) Examples

Wire Number	Explanation
999*0001-107	999 Contract 0001 sheet 001 of field wiring diagram 107 connected to panel terminal 107 and a field device
888*0001-1212(3)	888 Contract 0001 sheet 001 of field wiring diagram 1212 connected to panel terminal 1212 and a field device (3) third field wire connected to terminal 1212 within the panel

999*0001-107/G08	999 Contract 0001 sheet 001 of interconnection diagram 107/G08 connected to terminal 107 in first panel and terminal G08 in second panel
888*0003-1212GND	888 Contract 0003 sheet 003 of field wiring diagram 1212 connected to panel terminal 1212 and a field device GND wire is a ground wire

c. Cabinet, Console, Panel and Enclosure Wiring, Internal:

1) New Cabinets, Consoles, Panels and Enclosures:

a) Wires and cables located inside cabinets, consoles, panels, or enclosures must have designators.

2) Modified Cabinets, Consoles, Panels and Enclosures:

a) Label new or rerouted wire or cable in existing cabinets, consoles, panels, or enclosures as shown on the Drawings. Alternatively, assign a wire or cable designator equivalent to a field wire designator.

F. Terminal Strip Labeling:

1. Label the panel side of the terminal to match the panel wire number.
2. Number terminal strips within a panel sequentially. Label them with the letters "TB" followed by their number, e.g. “TB1”, “TB2”, etc.
3. Number terminals within a strip based on the line (rung) number where they are shown on the interconnection drawing.
4. If multiple terminals are shown on a single line of an interconnection drawing, subsequent terminals beyond the first will have an extra incrementing digit appended to the line number. For example, if there are 3 terminals shown on line 124 then they would be numbered as 124, 1241, 1242.

G. Voltage System Identification Directories

1. Provide voltage system identification directories as required by NEC Article 210 and NEC Article 215.
2. In each electrical room provide a voltage system identification directory mounted on the wall or door at each entrance to the room.

3. For panelboards, switchboards, motor control centers, and other branch circuit feeder distribution equipment that are not located in electrical rooms provide a voltage system identification directory mounted on the equipment.
    a. Affix directories using epoxy glue. Do not use screws or bolts that penetrate equipment enclosures.
    b. Directories must be readily visible and not obscure other labels and markings on the equipment.

H. Arc-flash Safety Signs:
1. Provide arc-flash safety signs for electrical equipment as required Section 26 05 73.
2. For equipment that contains a main overcurrent device and is compartmentalized, provide two labels: One label for the line side, and the second for the load side of the main overcurrent device.

I. Install electrical hazard signs on all equipment and enclosures that have a removable cover excluding junction, and pull boxes.

J. Underground Warning Tape:
1. Install in accordance with Section 26 05 43.

END OF SECTION

SECTION 26 09 19
CONTACTORS

PART 1 GENERAL

1.1 SUMMARY

A. Furnish labor, materials, equipment and incidentals required to provide contactors for non-motor loads as shown on the Drawings, specified or required.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 77 00 - Closeout Procedures

B. Section 26 05 26 - Grounding Systems

C. Section ***40 xx xx, Control Panel Instruments and Devices***

1.3 SUBMITTALS

A. Shop Drawings: Submit shop drawings. Include individual diagrams for each unit. These diagrams must include the following:

1. Wiring diagrams
2. Elementary control diagrams
3. Component and material lists
4. Component and unit layout drawings

B. Product Data: Submit manufacturers' specifications and technical data, cut sheets and dimensions for all components, materials and equipment proposed for use.

C. Operation and Maintenance Data:

1. Provide O&M data in accordance with Section 01 77 00 - Closeout Procedures.
2. Submit the following O&M Data:
   a. Schedule of installed Contactors containing voltage, ampacity, location, identification of connected load, model number and serial number.
   b. Catalog cut-sheets for contactors.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. The following are acceptable manufacturers:

1. Allen–Bradley
2. Square D
3. Eaton Corporation

2.2 MANUFACTURER’S UNITS

A. Non-motor Load Contractor:

1. Contractors must be UL Listed.

2. Type:
    a. Single coil, electrically operated, mechanically held or held with a permanent magnet.
    b. 600 V, industrial, heavy-duty, suitable for continuous duty with all types of non-motor loads.
    c. The number of poles and ampere rating will be as shown on the Drawings or specified herein.
    d. Single or double throw as shown on the Drawings or required.
3. Main Contacts:
    a. Silver alloy.
    b. Removable.
4. Coil Voltage:
    a. 120 V, obtained from external lighting circuit source if equipment source is equal to or less than 150 V, line to ground.
    b. 120 V, obtained from integral control power transformer with all ungrounded legs fused, if equipment source is greater than 150 V.
5. Accessories:
    a. Provide coil clearing contacts.
6. Enclosures:
    a. Provide control devices meeting the requirements of S***ection 40 xx xx, Control Panel Instruments and Devices***, as specified or shown on the Drawings.
    b. Miscellaneous hardware must be Type 316 stainless steel.
    c. Pushbuttons, pilot lights and selector switches must comply with ***Section 40 xx xx, Control Panel Instruments and Devices***.

PART 3 EXECUTION

3.1 INSTALLATION

A. Contractor must be provided as shown on the Drawings and specified herein.

B. Provide grounding per Section 26 05 26 - Grounding Systems.

END OF SECTION

SECTION 31 10 00
SITE CLEARING

GENERAL

1.1 SCOPE OF WORK

A. Section includes:

1. Protection of existing fences, infrastructure, and associated improvements, streets and utilities within and near construction areas from damage due to boulders, trees, or other objects dislodged during the construction process.
2. Labor, equipment, and materials necessary for existing tree relocation, protection and trimming.
3. Providing temporary stabilized crushed rock for staging/laydown in accordance with the Contract Documents.
4. All clearing and grubbing work indicated on the Drawings and as required, complete with cutting and removal of trees, shrubs, vegetation, stumps, logs, brush, roots and undergrowth, and disposal of materials.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 32 13 - Construction and Schedule Constraints

B. Section 01 33 00 - Submittal Procedures

C. Section 01 57 13 - Temporary Erosion and Sediment Control

1.3 REFERENCE STANDARDS

A. Comply with City of Clevland standards and applicable sections of the 2013 Ohio Department of Transportation (ODOT) Construction and Material Specifications, including current revisions, for paving and surfacing operations and materials, except as specifically modified in this specification.

1. Item 203 - Roadway Excavation and Embankment
2. Item 304 - Aggregate Base

B. Code of Standards of the American Association of Nurserymen and the American Standard for Nursery Stock and Tree Care Association Standards for Pruning and Guying of Shade Trees.

1.4 DEFINITIONS

A. AASHTO: American Association of State Highway and Transportation Officials

1.5 SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 - Submittal Procedures.

B. Name and location of plant providing aggregate.

C. Type and composition of proposed materials, including aggregate gradation.

D. Certificates of Compliance certifying compliance with the referenced specifications and standards.

E. Submit documentation, if applicable, of permission from property owners, of any timber removal or salvaged timber with work occurring outside of property or right-of-way limits.

F. Chain Link Protection Fencing: Submit proposed methods and sequence of site preparation to the Owner for review prior to start of Work.

G. Copy of Arborist's certification.

PRODUCTS

2.1 MATERIALS

A. Aggregate for Stabilized Staging/Laydown:

1. Construct the aggregate stabilized staging/laydown area base in conformance with Item 304 of the referenced ODOT specifications and AASHTO No. 1, 2, and 57 stone/rock as referenced on the Drawings.

EXECUTION

3.1 INSTALLATION

A. General:

1. Contractor is responsible to provide equipment, workmanship, and materials required to achieve a finished product which meets these specifications for the stabilized staging/laydown area.

2. Do not place aggregates on frozen subgrade or when air temperature is below 35°F.

3. Do not place aggregate materials when natural light is not sufficient to properly observe work on operations.

4. Do not place paving and surfacing material before subgrade is reviewed and accepted by the Owner. Do not place paving and surfacing materials on a frozen or muddy subgrade.

5. Provide adequate drainage at all times to prevent water from standing on subgrade.

B. Cleaning:

C. Clean Site of rubbish, excess material, structures, and equipment. Restore damaged property.

D. Overexcavation, Regrading, and Backfill Under Fill Areas:

1. Clear, grub, and excavate the fill areas. Overexcavate, regrade, and backfill the areas by removing and/or stockpiling undesirable soils. Recontour the ground surface to key the fill and eliminate severe or abrupt topographic changes. Backfill the overexcavated volumes to a level of 1 foot below the existing ground contours.

E. Soil Erosion and Sedimentation Control:

1. Provide, maintain, and remove all temporary and/or permanent soil erosion and sedimentation control measures at theProvide, maintain, and remove all temporary and/or permanent soil erosion and sedimentation control measures at the Contractor's expense, as specified on the Drawings or as determined by the Owner.
2. Implement the measures to prevent surface runoff from carrying excavated materials into waterways, reduce erosion of the slopes, and prevent silting in waterways downstream of the Work.
3. The measures should include provisions to reduce erosion by the wind of all areas stripped of vegetation, including material stockpiles.
4. Comply with requirements of Section 01 57 13 - Temporary Erosion and Sediment Control.

F. Seasonal Constraints:

1. No tree or shrub removal can take place between the dates listed in Section 01 32 13 - Construction and Schedule Constraints, unless coordination and approval is given through by the Owner.

G. Clearing:

1. Cut off trees, stumps, brush, hedges, and other vegetation flush with the ground and completely remove them within the Contract limits as defined on the Drawings or as directed by the Owner.
2. Use every precaution to prevent damage to and provide protection as necessary of existing plant material. Repair or replace to original condition, as acceptable to the Owner and at no additional cost to the Owner, any material or Work damaged or destroyed while performing Work.
3. Provide vegetation protection fencing as shown on the Drawings as the minimum required for the Work. Install additional temporary fencing as necessary during the Work to protect vegetation.
4. Flagging of Existing Trees: Flag trees to remain and to be removed with a bright and different colored ribbon. Notify the Owner at least 48 hours prior to commencing of Work to verify all trees that are flagged.
5. Do not park any vehicles or equipment, nor store any materials or stockpiled soil, nor dispose of building materials, chemicals, petroleum products or other detrimental substances within drip line of tree. Protect trees from flame, smoke and heat. Restrict construction access to the Site from occurring beneath the drip line of trees.

H. Clearing and Grubbing:

1. Completely remove trees, stumps, brush, shrubs, hedges, roots, corduroy, logs, matted roots, other vegetation, and debris within the Contract limits as defined on the Drawings or as directed by the Owner. Perform removal to the depth specified in paragraphs 3.01.H thru 3.01.L of this Section.

I. Selective Clearing:

1. Perform selective clearing by removing and disposing of dead, diseased, poorly formed, or otherwise undesirable trees, undergrowth, stumps, uprooted trees, and debris. Remove only the trees marked and undergrowth in areas indicated on the Drawings or designated by the Owner.
2. Selective Clearing, Type I:
    a. Cut off trees and stumps at an elevation not exceeding four (4) inches (100 mm) above the existing ground level.
3. Selective Clearing, Type II:
    a. Chip or grind down trees and stumps to an elevation approximately four (4) inches (100 mm) below the proposed ground level.

J. Depth of Removal in Excavation Area:
1. Remove trees, stumps, and roots within excavation areas in roadways, parking lots, and other paved areas to a depth of at least 12 inches (300 mm) below the subgrade elevation.
2. Remove trees, stumps, and roots in all other excavation areas to a depth of at least 12 inches (300 mm) below the finish surface elevation, or as indicated on the Drawings or designated by the Owner.

K. Depth of Removal in Embankment Areas:
1. Remove trees, stumps, and roots within embankment areas for roadways, parking lots, and other paved areas where the top of road material is five (5) feet (1.5 m) or less above the existing ground to a depth of at least 12 inches (300 mm) below the existing ground.
2. Cut off trees and stumps flush with the existing ground surface within embankment areas for roadways, parking lots, and other paved areas where the top of road material exceeds five (5) feet (1.5 m) in height above the existing ground.
3. Cut off trees and stumps flush with the existing ground surface for embankment areas other than roadways, parking lots, and other paved areas, or as indicated on the Drawings or designated by the Owner.

L. Removal of Trees, Stumps, and Other Vegetation:
1. Cut down trees in sections where felling them poses danger to traffic or risks injury to other trees, structures, or property.
2. Removal of stumps and roots may be accomplished by the use of a shredding machine meeting the approval of Owner.

M. Removing Corduroy:
1. Remove logs, stumps, poles, brush, and other unsatisfactory material within the Contract limits at or below the ground surface and within four (4) feet (1.2 m) below the proposed plan grade. Dispose of the material as directed.

2. Prohibit burial of trees, stumps, and other vegetation except at disposal areas indicated on the Drawings or determined by the Owner. Cover buried trees and stumps in these areas with a minimum of two (2) feet (0.6 m) of material.

N. Holes and Trenches:

O. Break down or level the sides of holes and trenches remaining after clearing or grubbing operations in embankment areas, then refill them with acceptable material.

   a. Moisten the material and compact it properly in layers using tampers or rollers to the density required under roadways, parking areas, and other special areas, as determined by the Owner.

   b. Apply the same construction procedure to all holes and trenches remaining in excavation areas where hole depth exceeds the proposed excavation depth.

P. Salvaging Timber:

1. Classify trees required to be removed with a diameter of four (4) inches (100 mm) or more as merchantable timber. Transfer merchantable timber on right of way, fee simple, to the Contractor unless otherwise specified in the Contract Documents. Obtain and provide the Owner with written permission from the property Owner when placing such material outside the right of way.

2. Cut and pile merchantable timber removed from areas outside the right-of-way, fee simple, for the use of the property owner unless the Contractor provides the Owner with a written agreement from property owner declining the salvaged timber. Transfer ownership of salvaged timber to the Contractor when such agreement is signed by the property owner.

3. Obtain and provide the Owner with written permission from the property owner when placing such material outside the Work limits. Leave timber from 4 to 12 inches (100 to 300 mm) in diameter in full tree lengths or cut to commercial lengths at the Contractor's option. Cut timber 12 inches (300 mm) or more in diameter into commercial lengths and pile separately from other timber.

Q. Existing Trees to Remain:

1. General:

   a. Protect root systems from smothering and restrict foot traffic to prevent excessive compaction of soil over root systems.

   b. Protect individual trees and areas shown to remain with six (6) foot high chain link fence. Install fencing before site preparation, grading, and clearing and grubbing operations.

   c. Do not remove existing trees designated to remain for convenience or ease of construction under any circumstances.

   d. Replace trees not to be removed that become damaged or die with trees of the same species and equal size.

e. Prior to installation, stake the location of protection fencing for approval by the Owner. Place location stakes or markings not greater than ten (10) feet on center.

2. Excavation Around Trees:

a. Protect root systems from smothering and restrict foot traffic to prevent excessive compaction of soil over root systems. Excavate within drip line of trees only where shown on the Drawings.

b. Tunnel under or around roots by hand digging where trenching for utilities occurs within drip line. Do not cut main lateral roots or tap roots. Notify the Owner prior to cutting roots over 6 inches in diameter. Cut roots up to and including 3/4-inch diameter by hand saws. Do not leave roots exposed to sun or drying for more than 24 hours. Protect all exposed roots with moist organic mulch or burlap and backfill as soon as possible.

c. Where excavating for new construction is required within drip line of tree, excavate by hand to minimize damage to roots and perform as follows:

1) Use narrow tine spading forks and comb soil to expose roots.

2) If main lateral roots are immediately adjacent to location of new construction, cut roots three (3) inches from new construction.

3) Do not allow exposed roots to dry out before permanent backfill is placed.

4) Provide temporary earth cover, or pack with peat moss and wrap with burlap.

5) Water and maintain in moist conditions until covered with backfill.

R. Trimming of Existing Trees:

1. General:

a. Perform tree pruning, tree repair, and tree removal with competent workers under the supervision of an arborist certified by the International Society of Arboriculture (ISA) or possessing equivalent education and experience. Do not perform pruning without approval from the Owner.

b. Coordinate with City of Cleveland Arborist when trimming or removing within public right of way to obtain approval.

2. Pruning:

a. Cut branches with sharp pruning instruments and do not break or chop.

b. Prune flush with trunk surface.

3. Trimming:

a. Preserve the symmetry of the tree; no stubs or splits or torn branches left; make clean cuts close to the trunk or large branch.

b. Do not use spikes for climbing live trees.

c. Coat cuts over 1-1/2 inches in diameter with an asphaltic emulsion material.

END OF SECTION

SECTION 31 11 00
CLEARING AND GRUBBING

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This section includes clearing and grubbing work indicated on the Plans and as required, complete with cutting and removal of trees, shrubs, vegetation, stumps, logs, brush, roots and undergrowth, and disposal of materials.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 57 13 - Temporary Erosion and Sediment Control

C. Section 01 89 00 - Site Construction Performance Requirements

D. Section 31 22 00 - Grading

E. Section 31 23 13 - Subgrade Preparation

1.3 SOIL EROSION AND SEDIMENTATION CONTROL

A. Contractor, at Contractor's expense, shall provide, maintain and remove such temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or as determined by the Landscape Architect.

B. Measures shall prevent surface runoff from carrying excavated materials into the waterways, to reduce erosion of the slopes, and to prevent silting in of waterways downstream of the Work.

C. Measures should include provisions to reduce erosions by the wind of all areas stripped of vegetation, including material stockpiles.

D. Comply with requirements of Section 01 57 13.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 CLEARING

A. Trees, stumps, brush, hedges, and other vegetation occurring within the contract limits as defined on the Plans or as directed by the Landscape Architect shall be cut off flush with the ground and shall be completely removed.

3.2 CLEARING AND GRUBBING

A. Trees, stumps, brush, shrubs, hedges, roots, corduroy, logs, matted roots, other vegetation and debris occurring within the contract limits as defined on the Plans or as directed by the Landscape Architect, shall be completely removed. Depth of removal shall be in accordance with the requirements specified below.

1. Depth of Removal in Excavation Areas

a. For excavation areas within roadways, parking lots, and other paved areas, the trees, stumps, and roots shall be removed to a depth of not less than 12 inches below the subgrade elevation.

b. In all other excavation areas, the trees, stumps, and roots shall be removed to a depth of not less than 12 inches below the finish surface elevation.

c. Unless otherwise indicated on the Plans or as designated by the Landscape Architect .

2. Depth of Removal in Embamkmnet Areas

a. Within embankment areas for roadways, parking lots, and other paved areas where the top of finished grade is 5 feet or less in height above the existing ground, the trees, stumps, and roots shall be removed to a depth of not less than 12 inches below the existing ground.

b. Within embankment areas for roadways, parking lots, and other paved areas where the top of finished grade is more than 5 feet in height above existing ground, the trees and stumps shall be cut off flush with the existing ground surface.

c. For embankment areas other than roadways, parking lots, and other paved areas, the trees and stumps shall be cut off flush with the existing ground surface,

d. Unless otherwise indicated on the Plans or as designated by the Landscape Architect.

3.3 SELECTIVE CLEARING

A. Selective clearing shall consist of removing and disposing of dead, diseased, poorly formed, or otherwise undesirable trees, undergrowth, stumps, uprooted trees and debris. Trees to be removed will be marked and the area where the undergrowth is to be removed will be indicated on the Plans or designated by the Landscape Architect.

B. Selective Clearing, Type I:

1. Trees and stumps shall be cut off at an elevation not more than 4 inches above the existing ground level.

C. Selective Clearing, Type II:

1. Trees and stumps shall be chipped or ground down to an elevation approximately 4 inches below proposed ground level.

3.4 REMOVAL OF TREES, STUMPS, AND OTHER VEGETATION

A. Where trees cannot be felled without danger to traffic or injury to other trees, structures or property, they shall be cut down in sections. Removal of stumps and roots may be accomplished by the use of a shredding machine meeting the approval of the Landscape Architect.

3.5 REMOVING CORDUROY

A. Logs, stumps, poles, brush, and other unsatisfactory material occurring in the contract limits at or below the surface of the ground and within the depth of 4 feet below the proposed plan grade shall be removed and shall be disposed of by the Contractor.

B. When material is disposed of outside of the contract limits, disposal shall be as specified in Section 01 89 00.

C. Burial of trees, stumps and other vegetation, will not be permitted, except at disposal areas indicated on the Plans or as determined by the Landscape Architect. Trees and stumps buried in these areas shall have a minimum cover of 2 feet.

3.6 HOLES AND TRENCHES

A. Holes and trenches remaining after the clearing or grubbing operations in embankment areas, shall have the sides broken down or leveled, and shall be refilled with acceptable material.

1. Material shall be moistened and properly compacted in layers by tampers or rollers to the density required under roadways, parking areas, and other special areas, as determined by the Landscape Architect.

2. The same construction procedure shall be applied to all holes and trenches remaining in excavation areas where the depth of holes exceeds the depth of proposed excavation.

3.7 SALVAGING TIMBER

A. Trees required to be removed and having a diameter of 4 inches or more are classed as merchantable timber. On right-of-way, fee simple, merchantable timber shall become the property of the Contractor, unless otherwise specified in the Contract Documents.

1. When such material is placed outside of the right-of-way, the Contractor shall obtain and provide the Landscape Architect with written permission from the property owner on which the timber is to be placed.

B. Merchantable timber to be removed from areas outside of right-of-ways, fee simple, shall be cut and piled for the use of property owner, except where the Contractor provides the Landscape Architect with a written agreement from the property owner that he does not desire the salvaged timber. Where the property owner has signed such an agreement, the salvaged timber will become the property of the Contractor.

C. When such material is placed outside the contract limits, the Contractor shall obtain and provide the Landscape Architect with written permission from the owner of the property on which the timber is to be placed. Timber from 4 to 12 inches in diameter may be left in full tree lengths or cut to commercial lengths, at the option of the Contractor. Timber 12 inches or more in diameter shall be cut into commercial lengths and piled separately from other timber.

END OF SECTION

SECTION 31 22 00
GRADING

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section includes site grading as indicated on the Plans, complete with removing and salvaging topsoil, rough grading, finish grading, adjusting structures, and reconstructing structures.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 57 13 - Temporary Erosion and Sediment Control

C. Section 01 89 00 - Site Construction Performance Requirements

D. Section 31 11 00 - Clearing and Grubbing

E. Section 31 23 13 - Subgrade Preparation

F. Section 31 23 16 - Structural Excavation and Backfill

G. Section 32 92 19 - Seeding

H. Section 32 92 23 - Sodding

1.3 SOIL EROSION AND SEDIMENTATION CONTROL

A. Provide, maintain, and remove all temporary and/or permanent soil erosion and sedimentation control measures at Contractor's expense, as specified on the Plans or as determined by the Landscape Architect.

B. Implement measures to prevent surface runoff from carrying excavated materials into waterways, reduce erosion of slopes, and prevent silting in waterways downstream of the Work.

C. Measures should include provisions to reduce erosion by the wind of all areas stripped of vegetation, including material stockpiles.

D. Comply with requirements of Section 01 57 13 - Temporary Erosion and Sediment Control.

1.4 REFERENCE STANDARDS

A. ASTM D698: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3).

B. Michigan Department of Transportation (MDOT), Standard Specifications for Construction, latest edition.

PART 2 PRODUCTS

2.1 GRANULAR MATERIAL

A. Class II granular material meeting the requirements of MDOT Section 902.

2.2 AGGREGATE BASE COURSE

A. 21AA dense graded aggregate conforming to MDOT Section 902.

PART 3 EXECUTION

3.1 SITE GRADING

A. Grade sites as specified on the Plans or as determined by the Landscape Architect. Perform grading to prevent standing water and soil saturation detrimental to structures and improvements.

B. Make provisions to preserve and protect trees and other vegetation specified on the Plans or determined by the Landscape Architect as not to be removed.

3.2 REMOVING AND SALVAGING TOPSOIL

A. Push back and preserve topsoil encountered along the construction route for use in restoration after completing the construction. Keep the topsoil on each parcel and lot throughout the Project, including the existing road right-of-way adjoining the parcel or lot where it originally existed.

B. Removal of topsoil from the Project or movement of topsoil from one portion of the Project for use in another portion of the Project will not be allowed.

C. Remove and stockpile topsoil if the working area is insufficient, then replace it on the original lot or parcel. Provide the Landscape Architect with written permission from the property owner of the stockpile location before starting the stockpiling operation.

D. Salvage topsoil in the quantity required by the Plans. Dispose of any excess topsoil beyond the amount required by the Plans or as directed by the Landscape Architect at Contractor's expense.

E. Reduce vegetation to a height of approximately 4 inches before removing topsoil. Remove and dispose of all such vegetation, brush, stones, rocks, and any other objectionable litter or foreign material before breaking the ground for topsoil removal.

F. Use equipment and methods that avoid lifting the subsoil. Cease stripping when soil or weather conditions are unsuitable, and resume only when conditions allow suitable operation.

G. Remove topsoil within the grading limits for cuts to the width and depth specified on the Plans or as determined by the Landscape Architect.

H. Stockpile topsoil within the limits of construction in areas designated on the Plans or in areas out of the way of construction as determined by the Contractor.

I. Locate and shape stockpiles to avoid diverting storm water runoff, either into or out of construction limits, toward buildings, creating standing water, or interfering with controlled irrigation.

J. Do not place topsoil around trunks and root areas of trees to be preserved.

K. Keep topsoil separate from other excavated materials used for embankment and completely remove it from any designated area before starting regular excavation or placing embankment in that area.

L. Locate topsoil stockpiles as close to the original location as possible; do not allow payment for overhaul.

M. After completing construction, screen the topsoil through a 5/8 inch maximum size mesh screen, then spread, grade, rake, and prepare it for seeding or sodding.

3.3 EXISTING SAND ON-SITE

A. When construction occurs within private easements, do not remove sand from each parcel or lot. Use sand encountered in existing road right-of-way for construction purposes throughout the Project, provided it meets the material requirements for its intended use.

B. Removal of sand from the Project will not be allowed, except for the volume displaced by the new construction.

C. If working area is insufficient, remove, stockpile, and replace the sand on the original lot or parcel. Provide the Landscape Architect with written permission from the property owner of the stockpile location before starting stockpiling operations.

3.4 ROUGH GRADING

A. Grade the site as needed to comply with the Plans or as directed by the Landscape Architect. Roughly establish the subgrade by cutting or filling, keeping it approximately parallel to proposed finished grades and at elevations that accommodate topsoil thickness and installation of site or roadway improvements.

B. Remove all debris from fill areas before filling. Remove and properly dispose of any material detrimental to site improvement as specified in Section 01 89 00.

C. Scarify and bench the original ground, or treat it otherwise, to ensure adequate bond and prevent fill slippage.

D. Use fill material free of debris or detrimental substances and maintain moisture content within 2% of optimum when placing. Compact fill to at least 95% of maximum unit weight, placing it in layers no less than 9 inches and no greater than 15 inches. Determine maximum unit weight according to ASTM D698, Method B.

E. Construct fills or embankments when the ground is frost-free and weather is favorable. If winter grading is necessary, remove all ice and snow from the ground surface before placing the fill or embankment.

F. No frozen material will be allowed in the fill area or in the embankment being constructed.

1. Remove frozen material from a partially completed fill before placing additional fill. Stockpile frozen material outside grading limits until thawed.

2. Thawed material from the stockpiled frozen material may be used in the fill and embankment areas.

3.5 FINISH GRADING

A. Smooth the subgrade parallel to proposed finished grades and elevations specified on the Plans. Scarify the subgrade to ensure bond with the topsoil before spreading the topsoil.

B. Spread topsoil uniformly to provide a smooth, even surface at the finish grade specified on the Plans or acceptable to the Landscape Architect. After spreading, compact the topsoil lightly as necessary to minimize settlement. Ensure final grades do not vary more than 0.1 foot from the elevations indicated on the Plans.

C. Perform finished grading when the ground is frost-free and weather conditions are favorable.

3.6 ADJUST STRUCTURES

A. Adjust structures as called for on the Plans or directed by the Landscape Architect. Apply adjustments where the casting elevation is raised 12 inches or less, or lowered 6 inches or less.

B. For Rehabilitation/Resurfacing Projects

1. Sawcut pavement for structures in existing pavement to a minimum of 5-foot by 5-foot unless otherwise shown on the plans.

a. Adjust structures in concrete pavement, then backfill and compact as specified. Place six inches of aggregate base course below the proposed concrete pavement unless the Plans specify otherwise.

1) In areas of new concrete pavement, pour new concrete pavement around the structure integral with the rest of the pavement.

2) Place expansion or epoxy anchored hook bolts at 18 inches on center around the edges of the existing concrete pavement for resurfacing projects, unless plans show otherwise. Replace concrete pavement, minimum 8 inches thick, around the structure to match the grade of the adjoining concrete pavement.

b. For structures in bituminous pavement, do not sawcut bituminous pavement until after completing the bituminous base or leveling courses. Adjust, backfill, and compact the structure as noted below.

1) Place six inches of aggregate base course below the proposed pavement, unless otherwise noted on the plans. Place a minimum of 8 inches of concrete pavement to the elevation of the adjoining bituminous base or leveling courses, unless otherwise noted on the plans.

2) Place the bituminous wearing course around the structure integral with the wearing course on the remainder of the project.

C. For Bituminous Reconstruction or New Construction Projects

1. Remove the frame and cover on new and existing structures and plate the structure before placing the bituminous base or leveling courses.

2. Place bituminous base and leveling courses over the plated structures.

3. Sawcut the bituminous base and leveling courses a minimum of 5-foot by 5-foot before placing the bituminous wearing course, unless the Plans indicate otherwise. Adjust, backfill, and compact the structure as noted below.

4. Place six inches of aggregate base course below the proposed pavement, unless the Plans note otherwise. Place a minimum of 8 inches of concrete pavement up to the elevation of the adjoining bituminous base course, unless the Plans note otherwise.
5. Place the bituminous wearing course around the structure integral with the wearing course on the remainder of the project.

D. Include sawcutting, removal, and replacement of concrete and bituminous pavement, and aggregate base course as incidental to adjusting the structure, unless otherwise noted in the Contract Documents.

E. Carefully remove and store the existing frame and cover, then reinstall them on the same structure unless the Plans call for a new frame and cover.

F. Remove or install brick courses or concrete adjustment rings as necessary to adjust the structure's frame and cover to the proper elevation.

G. Set brick or concrete adjustment rings in mortar or install them as shown on the Plans and as determined by the Landscape Architect.

H. Apply a masonry plaster coat, minimum 1/2 inch thick, to the outside surface of the new brick or block structures.

I. Backfill the structure properly with granular material, compact it in place, and ensure it meets the approval of the Landscape Architect.

J. Maintain flow in the entire system at the Contractor's expense while performing any part of the Work. Clean the structure and dispose of all unsuitable material at the Contractor's expense.

3.7 RECONSTRUCT STRUCTURES

A. Reconstruct structures as called for on the Plans or as determined by the Landscape Architect. Apply reconstruction where the elevation of the casting requires raising more than 12 inches, lowering more than 6 inches, or to rebuild portions of the existing structure which are deteriorated.

B. For Rehabilitation/Resurfacing Projects:

1. Sawcut the pavement in existing pavement areas to a minimum of 5-foot by 5-foot unless otherwise shown on the plans.
    a. Reconstruct, backfill, and compact structures in concrete pavement as noted below. Place six inches of aggregate base course below the proposed concrete pavement, unless otherwise noted on the Plans.
        1) Pour the concrete pavement around the structure integral with the rest of the new concrete pavement.
        2) Place expansion or epoxy anchored hook bolts 18 inches on center around the edges of the existing concrete pavement for resurfacing projects, unless otherwise shown on the plans. Replace the concrete pavement, minimum 8 inches thick, around the structure to the grade of the adjoining concrete pavement.

b. Do not sawcut the pavement in bituminous pavement areas until after completing the bituminous base or leveling courses.

1) Reconstruct, backfill, and compact the structure as noted below.

2) Place six inches of aggregate base course below the proposed pavement, unless otherwise noted on the Plans. Place a minimum of 8 inches of concrete pavement to the elevation of the adjoining bituminous base or leveling courses, unless otherwise noted on the Plans.

3) Place the bituminous wearing course around the structure integral with the wearing course on the remainder of the Project.

C. For Bituminous Reconstruction or New Construction Projects:

1. Remove the frame and cover on all new and existing structures and plate the structure before placing the bituminous base or leveling courses.

2. Place bituminous base and leveling courses over the plated structures.

3. Sawcut the bituminous base and leveling courses a minimum of 5-foot by 5-foot before placing the bituminous wearing course, unless otherwise shown on the Plans. Reconstruct, backfill, and compact the structure as noted below. Place six inches of aggregate base course below the proposed pavement, unless otherwise noted on the plans.

4. Place a minimum of 8 inches of concrete pavement to the elevation of the adjoining bituminous base course, unless otherwise noted on the plans.

5. Place the bituminous wearing course around the structure integral with the wearing course on the remainder of the Project.

D. Include sawcutting, removal, and replacement of concrete and bituminous pavement, and aggregate base course as incidental to reconstructing the structure unless otherwise noted in the Plans.

E. Carefully remove and store the existing frame and cover, then reinstall them on the same structure unless the Plans call for a new frame and cover.

F. Remove existing corbel entrance sections or precast concrete chimney-type entrance, along with any additional brick courses or precast concrete sections needed to achieve the reconstruction amount called for on the Plans or determined by the Landscape Architect.

G. Install necessary brickwork and precast concrete sections to meet the design grade.

H. Furnish and install manhole steps as necessary, maintaining maximum spacing of 24 inches. Set brick or concrete adjustment rings in mortar or install as shown on the Plans and as determined by the Landscape Architect.

I. Apply a masonry plaster coat, minimum 1/2 inch thick, to the outside surface of the new brick or block structures. Backfill the structure properly with granular material, compact in place, and obtain approval from the Landscape Architect.

J. Maintain flow in the entire system at the Contractor's expense while performing any part of the Work. Clean the structure and dispose of unsuitable material at the Contractor's expense.

END OF SECTION

SECTION 31 23 33
TRENCHING AND BACKFILLING

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section includes open trench construction for utility installation, complete with trenching, sheeting, bracing, bedding, bedding materials, backfilling, backfill materials, and compaction.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 57 13 - Temporary Erosion and Sediment Control

B. Section 01 89 00 - Site Construction Performance Requirements

C. Section 31 11 00 - Clearing and Grubbing

D. Section 31 22 00 - Grading

E. Section 31 23 16 - Structural Excavation and Backfill

F. Section 31 23 19 - Dewatering

G. Section 32 92 19 - Seeding

H. Section 32 92 23 - Sodding

I. Section 33 14 00 - Water Utility Distribution Piping

J. Section 33 30 00 - Sanitary Utility Sewerage Piping

K. Section 33 31 00 - Sanitary Sewerage Piping

L. Section 33 41 00 - Storm Utility Drainage Piping

1.3 REFERENCE STANDARDS

A. Conform to the applicable portions of the following Standard Specifications for the Work in this Section, unless otherwise specified:

1. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete
2. ASTM C150/C150M - Standard Specification for Portland Cement
3. ASTM C595/C595M - Standard Specification for Blended Hydraulic Cements
4. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
5. ASTM C1479/C1479M - Standard Practice for Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations
6. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))
7. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
8. American Association of State Highway Transportation Officials

9. Michigan Department of Transportation (MDOT), Standard Specifications for Construction, latest edition

1.4 TEST REPORTS

A. Testing laboratory must provide the Landscape Architect with two (2) certified copies of the test results of the compaction of the backfill.

B. Perform testing for compaction and certify the test results through a testing laboratory approved by the Landscape Architect.

1.5 MIX DESIGN

A. Submit mix designs for any concrete or flowable fill mixtures to be used on the Project. Include certified test results for seven day and 28 day strengths, together with any technical information for admixtures.

1.6 SOIL EROSION AND SEDIMENTATION CONTROL

A. Provide, maintain, and remove temporary and/or permanent soil erosion and sedimentation control measures at Contractor's expense, as specified on the Plans or as determined by the Landscape Architect.

B. Prevent surface runoff from carrying excavated materials into the drain, reduce erosion of the slopes, and prevent silting in of the drain downstream of the Work.

C. Measures should include provisions to reduce erosions by the wind of all areas stripped of vegetation, including material stockpiles.

D. Comply with requirements of Section 01 57 13.

PART 2 PRODUCTS

2.1 GRANULAR MATERIALS CLASS II

A. Conform to the requirements for Granular Material Class II as specified in MDOT Section 902, except the granular material must be natural bank run sand with a maximum size of 1-1/2 inches.

2.2 CRUSHED STONE BEDDING

A. Crushed, angular, natural stone material, meeting the requirements of 21AA coarse aggregate as specified in MDOT Section 902. Crushed concrete and slag are not allowed.

2.3 CONCRETE

A. Conform to MDOT Section 1004 ; use 3,000 psi strength; Type IA cement; MDOT 6A coarse aggregate; MDOT 2NS fine aggregate; 3 inch maximum slump; no admixtures without Landscape Architect's approval.

2.4 FLOWABLE FILL FOR BACKFILLING

A. Materials

1. Use Fly Ash with a maximum loss on ignition of 12% and meet the other requirements of ASTM C618 (Class F).

2. Ensure water meets the requirements of ASTM C94/C94M.
3. ASTM C150/C150M or ASTM C595/C595M, Type I or Type IA.

B. Mixture (Strength 100 to 120 psi)

1. Fly Ash: 2,000 lbs per cyd min
2. Cement: 70 lbs per cyd min
3. Water: Sufficient water to produce desired flowability 700 lbs per cyd

C. Maintain the temperature of the flowable fill mix at a minimum of 50 degrees Fahrenheit during manufacture and delivery.

D. The flowable fill can be mixed by pugmill, central concrete mixer, ready mix truck, turbine mixer, or other acceptable equipment or method.

PART 3 EXECUTION

3.1 DEWATERING

A. Dewater the area within the vicinity of the trenching operation in accordance with Section 31 23 19 prior to the trenching operation.

B. Ensure the depth of dewatering is sufficient to allow trench excavation, backfilling, and compacting to proceed in a dry condition.

3.2 TRENCH EXCAVATION

A. Include site clearing and grubbing, excavation of all encountered materials, supporting and protecting structures and/or utilities above and below ground, and removal of water from the construction site in open cut trench excavation.

B. Commence the trenching operation at the downstream or outlet end of the new Work and proceed upstream, unless otherwise specified on the Plans or directed by the Landscape Architect.

C. Excavate the trench in reasonably close conformity with the lines and grades specified on the Plans or as established by the Landscape Architect.

D. Temporarily store excavated materials along the trench without causing damage to trees, shrubs, fences, improvements, utilities, private or public property, or traffic. Avoid placing excavated materials in locations that endanger trench banks by imposing loads.

E. Excavate the trench for rigid pipe to a width sufficient to provide adequate working space for pipe installation and compaction of bedding material under and around the pipe. Ensure the width of the trench from below the pipe bedding to 12 inches above the top of the pipe does not exceed the following dimensions:

Diameter of Pipe	Width of Trench
6 thru 12 inch pipe	30 inches wide
15 thru 36 inch pipe	outside diameter plus 16 inches
42 thru 60 inch pipe	outside diameter plus 20 inches
over 60 inch pipe	outside diameter plus 24 inches

1. When the maximum trench width specified for rigid pipe is exceeded, install at Contractor's expense, concrete encasement to support the additional load of the backfill. Completely surround the pipe with encasement having a minimum thickness of 1/4 the outside diameter of the pipe or 4 inches, whichever is greater; or at Contractor's expense, install another type bedding, approved by the Landscape Architect. Use 3,000 psi strength concrete for the encasement.

F. For flexible pipe, ensure the minimum trench width is not less than the greater of the pipe outside diameter plus 16 inches or the pipe outside diameter times 1.25, plus 12 inches. Do not exceed the minimum width by more than 6 inches for the maximum trench width.

1. When the maximum trench width specified for flexible or semi-rigid pipe is exceeded, install at Contractor's expense, crushed stone bedding material to the full width between undisturbed trench walls or at least 2.5 pipe diameters on each side of the pipe to support the additional load of the backfill.

G. When proper alignment and grade cannot be maintained due to construction procedure or unsuitable ground conditions, excavate below the normal trench bottom grade at Contractor's expense. Fill the void with large size aggregate or 3,000 psi (21 MPa) concrete as approved by the Landscape Architect to ensure the pipe maintains correct alignment and proper grade when laid in the proper bedding.

H. Brace and/or sheet trench excavations, including those for shafts and structures, adequately to prevent caving or squeezing of the soil.

3.3 SHEETING, SHORING, AND BRACING

A. Furnish, place, and maintain sheeting, shoring, and bracing of the trench and/or shaft as required to ensure the safety of workmen and protect the new Work, adjacent structures, including pavement, curbs, sidewalks, pipelines, and conduits next to or crossing the trench, and to protect pedestrian and vehicular traffic.

B. Take full responsibility for the complete design of all sheeting, shoring, and bracing Work. Design for the specific soil conditions and ensure strength, quality, dimension, and spacing sufficient to prevent caving, ground loss, or squeezing within the neat lines of the excavation, and to effectively restrain movement of adjacent soil.

C. Submit plans for installing sheeting, shoring, or bracing to the Landscape Architect for informational purposes prior to installation.

D. Conform sheeting, shoring, bracing, and excavation to current federal or state safety regulations.

E. Install and leave sheeting, shoring, and bracing in place where indicated on the Plans and necessary in the Work. Do not pay additional compensation to Contractor for sheeting, shoring or bracing left in place.

F. Conform supports for pipes, conduits, etc. crossing the trench to the requirements of the facility owners and leave them in place if necessary.

G. Furnish, place, brace, maintain, and remove sheeting, shoring, and trenching materials at the Contractor's expense.

H. Do not remove trench sheeting, shoring, and bracing until the pipe is properly bedded and the trench backfilled to sufficiently support external loads.

I. Install sheeting, shoring, and bracing material without contact with the pipe, preventing concentrated loads or horizontal thrusts from transmitting to the pipe.

3.4 PIPE BEDDING

A. Install and compact in 6 inch layers. Take particular care to fill and tamp all spaces under, around, and above the top of the pipe. Work by hand in and around the pipe to provide uniform support.

B. Rigid Pipe Bedding:

1. Conform rigid pipe bedding to ASTM C1479, except as noted.

2. Class R-A:

a. Bed pipe in crushed stone material on the trench bottom. Ensure bedding has a minimum thickness beneath the pipe of 4 inches or 1/4 of the outside diameter of the pipe, whichever is greater, and extends up the sides of the pipe to the horizontal centerline.

b. Cover the top half of the pipe with a monolithic plain concrete arch having a thickness of at least 4 inches or 1/4 of the inside diameter of the pipe, whichever is greater, at the pipe crown, and a minimum width equal to the outside diameter of the pipe plus 8 inches or 1-1/4 of the diameter of the pipe, whichever is greater.

3. Class R-B:

a. Bed the pipe in crushed stone bedding material placed on the trench bottom. Ensure the bedding has a minimum thickness beneath the pipe of 4 inches or 1/8 of the outside diameter of the pipe, whichever is greater, and extends up the sides of the pipe to the horizontal centerline.

b. Backfill from pipe horizontal centerline to a level not less than 12 inches above the top of the pipe using granular material Class II. Place this material in 6 inch layers and thoroughly compact each layer by mechanical means until the finished compacted material reaches a minimum of 12 inches above the top of the pipe.

4. Class R-C:

a. Bed the pipe in granular material Class II placed on the trench bottom. Ensure the bedding has a minimum thickness beneath the pipe of 4 inches or 1/8 of the outside diameter of the pipe, whichever is greater, and extend the bedding to a level not less than 12 inches above the top of the pipe.

b. Place this material in 6 inch , thoroughly compact each layer by mechanical means, and ensure the finished compacted material reaches a minimum 12 inches above the top of pipe.

C. Flexible Pipe Bedding:

1. Conform flexible pipe bedding to ASTM D2321, except as noted.Provide a continuous and uniform bedding in the trench for all buried pipe.
2. Class F-I:
    a. Bed the pipe in crushed stone bedding material placed on the trench bottom. Ensure the bedding has a minimum thickness of 4 inches and beneath the pipe and extends up the sides until the top of the pipe is covered by at least 12 inches of material.
    b. Use bedding to the full width between undisturbed trench walls where allowable trench widths are exceeded. Do not use concrete cradle bedding.
3. Class F-II:
    a. Bed the pipe in crushed stone bedding material placed on the trench bottom. Ensure the bedding has a minimum thickness beneath the pipe of 4 inches or 1/8 of the outside diameter of the pipe, whichever is greater, and extends up the sides of the pipe to the horizontal centerline.
    b. Backfill from pipe horizontal centerline to a level not less than 12 inches above the top of the pipe using granular material Class II. Place this material in 6 inch layers and thoroughly compact each layer by mechanical means until the finished compacted material reaches a minimum of 12 inches above the top of pipe.
    c. Use bedding to the full width between undisturbed trench walls where allowable trench widths are exceeded. Do not use concrete cradle bedding.
4. Class F-III:
    a. Bed the pipe in granular material Class II placed on the trench bottom. Ensure the bedding has a minimum thickness beneath the pipe of four 4 inches or 1/8 of the outside diameter of the pipe, whichever is greater, and extends to a level not less than 12 inches above the top of the pipe. Place this material in 6 inch layers and thoroughly compact each layer by mechanical means until the finished compacted material reaches a minimum of 12 inches above the top of the pipe.
    b. Use bedding to the full width between undisturbed trench walls where allowable trench widths are exceeded. Do not use concrete cradle bedding.

3.5 BACKFILLING TRENCHES

A. Place backfill material on sections of bedded pipes only after receiving approval from the Landscape Architect for the pipe bedding and backfill materials.

B. Follow pipe laying with trench backfilling as closely as possible. Do not allow pipe laying in any trench to precede backfilling by more than 100 feet, unless otherwise directed by the Landscape Architect.

C. Do not perform backfilling in freezing weather except by permission of the Landscape Architect. Avoid using frozen materials in trench backfilling.

D. Use the following trench backfill specifications for the portion of the trench beyond the pipe bedding, which normally ends 12 inches above the top of the pipe. Place backfill

material above the pipe bedding free of cinders, ashes, refuse, boulders, roots, stumps, trees, timbers, brush, debris, or other materials deemed unsuitable by the Landscape Architect. Do not place rocks or stones larger than 6 inches within three 3 feet of the top of the pipe. Place large stones in the remainder of the trench backfill only if well separated and arranged to avoid interference with backfill settlement.

E. Conform the type and method of backfilling to the following requirements based on its location and function:

1. Trench B:

a. Backfill trenches under road surfaces, pavement, curb, driveway, sidewalk, and where the trench edge is within three 3 feet of the pavement, as well as areas noted on the Plans, with natural bank run sand meeting the requirements of granular material Class II, unless otherwise indicated on the Plans.

b. Backfill trenches under pavement to be constructed in the near future, as noted or shown on the Plans, with natural bank run sand meeting the requirements of granular material Class II, unless otherwise indicated on the Plans.

c. Where a pipe is installed under an existing or proposed utility, backfill between the two with natural bank run sand meeting the requirements of granular material Class II, unless otherwise indicated on the Plans, and construct as herein specified.

d. Place the material in uniform layers that can be adequately compacted and tested from the surface of each layer. Compact each layer to 95% of the material's maximum unit weight, unless otherwise specified on the Plans or by the Landscape Architect.

2. Trench A;

a. Backfill trenches with suitable excavated material placed in uniform layers that can be adequately compacted and tested from the surface of each layer.

b. Thoroughly compact each layer by approved mechanical methods to a density equivalent to the undisturbed adjacent soil or 90% of its maximum unit weight, whichever is less.

3. Carry trench backfill to the level of the adjacent existing ground or proposed grade, whichever is higher, unless otherwise specified on the Plans or directed by the Landscape Architect.

4. Use care to avoid displacing any pipes or structures due to fluid pressure where flowable fill is used for backfill or bedding as shown on the Plans or specified. Secure pipes in backfill areas as needed to counteract the buoyancy effect.

3.6 COMPACTING BACKFILL

A. Do not pay separately for backfill compaction; consider it incidental to the work of pipe installation and backfilling, including all soil manipulation to achieve the specified densities. Do not allow additional compensation for delays required to obtain the specified moisture content or density.

3.7 CLEANUP

A. Immediately remove and dispose of excess material by the Contractor, at the Contractor's expense, as specified in Section 01 89 00, following the placing and compacting of the backfill. Level the construction area and leave it in a neat, workmanlike condition.

B. Rake the disturbed area at a seasonally correct time approved by the Landscape Architect, place topsoil thereon, and restore the area.

1. Restore the area with seed, fertilizer, and mulch according to the requirements of Section 32 92 19 .

2. Restore with sod in accordance with Section 32 92 23.

3.8 FIELD TESTING

A. Conduct testing for compaction or density of the backfill during the Work when required by the Landscape Architect. Perform sampling and testing through a testing laboratory suitable to the Owner and approved by the Landscape Architect.

B. Define the maximum unit weight, when measuring soil compaction or density, as the maximum unit weight per cubic foot or cubic meter determined by ASTM D1557, Method C.

3.9 DEFECTIVE WORK

A. Correct any portion of the trench backfill deficient in the specified density using methods approved by the Landscape Architect.

B. Charge additional testing or sampling required due to deficiencies to the Contractor's expense.

END OF SECTION

SECTION 31 35 00
SLOPE PROTECTION

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section includes plain riprap, grouted riprap, concrete slope paving, precast concrete block slope paving, interlocking precast concrete slope paving, grouted flagstone, crimped straw, hydroseeding with cellulose, wood fiber mulch, wire mesh gabions, precast concrete grid slope pavers, geotextile filter fabric, and concrete bag slope protection.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 57 13 - Temporary Erosion and Sediment Control

C. Section 01 89 00 - Site Construction Performance Requirements

D. Section 04 05 11 - Mortaring and Grouting

E. Section 32 92 19 - Seeding

F. Section 32 92 23 - Sodding

1.3 REFERENCE STANDARDS

A. ASTM A90: Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings

B. ASTM A239: Standard Practice for Locating the Thinnest Spot in a Zinc (Galvanized) Coating on Iron or Steel Articles

C. ASTM A615/A615M: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

D. ASTM A1064/A1064M: Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

E. ASTM C309: Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

F. ASTM D4355/D4355M: Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc-Type Apparatus

G. ASTM D4491/D4491M: Standard Test Methods for Water Permeability of Geotextiles by Permittivity

H. ASTM D4533/D4533M: Standard Test Method for Trapezoid Tearing Strength of Geotextiles

I. ASTM D4632/D4632M: Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

J. ASTM D4751: Standard Test Methods for Determining Apparent Opening Size of a Geotextile

K. ASTM D6241: Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile- Related Products Using a 50-mm Probe

L. ASTM G153: Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

M. Michigan Department of Transportation (MDOT), Standard Specifications for Construction, latest edition.

N. U.S. Department of Commerce, National Bureau of Standards.

1.4 SUBMITTALS

A. Manufacturer's Literature:

1. Submit manufacturer's literature describing materials and fabrication methods for the type of geotextile filter fabric, wire mesh gabions, precast concrete slope pavers, preseeded erosion control blankets and precast concrete grid pavers proposed for use in the Work.

B. Samples:

1. Submit samples of the types of geotextile filter fabric proposed for use in the Work to the Landscape Architect.

C. Shop Drawings:

1. Submit shop drawings of wire mesh gabions showing wire sizes, finishes, fabrication, assembly and erection methods for all wire mesh gabions proposed for use in the Work.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Geotextile Filter Fabric:

1. Wrap geotextile filter fabric in a heavy-duty covering during delivery, storage, and handling to protect it from direct sunlight, ultraviolet rays, temperatures above 140 degrees Fahrenheit, mud, dirt, dust, debris and the elements.

B. Wire Mesh Gabions:

1. Protect polyvinyl chloride coated wire mesh gabions against freezing temperatures and damage to the PVC coating during delivery, storage, and handling.

1.6 CONDITIONS

A. Temperature:

1. Comply with the requirements for placing slope protection materials due to outside ambient air temperatures as specified in this Section.

B. Subbase Conditions:

1. Comply with the requirements for placing slope protection materials on prepared subbase because of frost and freezing conditions as specified in this Section.

C. Slope Protection Materials:

1. Comply with the requirements for protection of slope protection materials during curing periods as described in this Section.

1.7 SOIL EROSION AND SEDIMENTATION CONTROL

A. Provide, maintain, and remove temporary and/or permanent soil erosion and sedimentation control measures, at Contractor's expense, as specified on the Plans or determined by the Landscape Architect. Prevent surface runoff from carrying excavated materials into drains, reduce erosion of slopes, and prevent silting downstream of the Work. Include provisions to reduce wind erosion of all areas stripped of vegetation, including material stockpiles.

B. Comply with requirements of Section 01 57 13.

PART 2 PRODUCTS

2.1 FORM WORK

A. Use metal or wood forms for concrete. Ensure forms are straight, free from warps, and strong enough to resist springing during concrete depositing against the form surfaces.

2.2 CONCRETE

A. Use concrete conforming to MDOT Section 1004, with 3500 psi strength; Type IA cement; MDOT 6A coarse aggregate; MDOT 2NS fine aggregate; 3 inch maximum slump; and no admixtures without the Landscape Architect's approval.

2.3 CONCRETE REINFORCEMENT

A. In accordance with MDOT Section 905, use ASTM A615/A615M, Grade 60 for bars and ASTM A1064/A1064M for welded wire fabric.

2.4 MEMBRANE CURING COMPOUND

A. Use a transparent membrane-type curing compound conforming to ASTM C309, Type I, Blass B vehicle. Base tests for moisture retention, reflectance, and drying time on a curing compound application rate of one 1 gal per 200 sft of surface.

2.5 STONE RIPRAP

A. Use stone for riprap that is sound, tough, durable, and free from structural defects. Ensure stone is a minimum of 8 inch thick measured perpendicular to the slope, with a least surface dimension of 12 - 16 inches measured parallel to the slope. Maintain a maximum to minimum ratio not exceeding 3:1.

2.6 CONCRETE RIPRAP

A. Use sound pieces of broken concrete free of soil, protruding reinforcing steel, bituminous, and similar materials. Ensure a minimum thickness of 8 inch and a least surface dimension of 12 - 16 inches measured parallel to the slope. Maintain a maximum to minimum ratio not exceeding 3:1.

2.7 PRECAST CONCRETE BLOCK

A. Cast precast concrete blocks in the factory to the sizes indicated on the Plans. Ensure precast concrete blocks attain a minimum compressive strength of 3000 psi in 28 days

and have a maximum water absorption rate of ten 10 lbs / cft when tested according to ASTM C140/C140M with the following exceptions:

1. Compressive Strength:
    a. Compression test specimens having surface dimensions of 4 inch x 4 inch will be sawed from the units. The specimen will be tested with the load applied in the direction of the unit thickness.
2. Absorption:
    a. Determine the amount of water absorption on half of the same unit from which the compression test specimen was sawed.

2.8 PRECAST CONCRETE GRID SLOPE PAVERS

A. Conform precast concrete grid slope pavers to the minimum physical properties listed below:
    1. Length: 23 inches
    2. Width: 15 inches
    3. Thickness: 4 inches
    4. Area, Gross: 345 square inches
    5. Area, Upper Surface: 95 square inches
    6. Area, Base Surface: 326 square inches
    7. Bearing Capacity: 100 lbs / sft
    8. Strength, Comprehensive: 4000 psi

2.9 INTERLOCKING PRECAST CONCRETE SLOPE PAVERS

A. Compose interlocking precast concrete slope pavers of precast concrete blocks that interlock together either through a mechanical system or through the design of the blocks themselves. Lay the blocks on a geotextile fabric.

B. Ensure the precast concrete block units have the following minimum properties:
    1. Comprehensive Strength: 2500 psi
    2. Weight: 25 lbs / sft
    3. Thickness: 4 inches

C. Assemble the system to have a minimum of 20% open area suitable for sustaining vegetation.

D. Use geotextile fabric made of either woven or nonwoven polypropylene with an apparent opening size per ASTM D4751 less than 30 US Std Sieve.

E. Use a noncorrosive mechanism for interlocking the precast concrete units that suits its intended use.

2.10 EROSION CONTROL

A. Stabilize areas by crimping straw into the ground using a mulch anchoring tool (disc with vertical coulters), hydroseeding with cellulose, or applying wood fiber mulch per Section 01 57 13 - Temporary Erosion and Sediment Control.

2.11 PRESEEDED EROSION CONTROL BLANKETS

A. Use soil erosion control blankets made of a 70% straw, 30% coconut fiber matrix sewn between two (2) UV stabilized nets, with a cellulose fiber bottom tissue. Compose the blanket of:

1. Straw: 0.35 lbs / syd
2. Coconut fibers: 0.15 lbs / syd

B. Make the roll a minimum of 6.5 feet. Include a seed mixture in the blanket. Use the following components in the seed mixture:

1. Kentucky Blue Grass: 50%
2. Red Top: 10%
3. Rye: 35%
4. Clover: 5%

C. Ensure the seed mixture conforms to Section 32 92 19. Use preseeded erosion control blankets such as North American Green cell-o-seed, SC150, or Landscape Architect approved equal.

2.12 FLAGSTONE

A. Use sound, tough, durable limestone or seasoned sandstone slabs free from structural defects for flagstone. Select irregular-shaped units with the thickness indicated on the Plans. Apply the following aggregate sizes for individual flagstone units in the overall flagstone work:

1. 25% approximately 64 sq inches
2. 50% approximately 144 sq inches
3. 25% approximately 324 sq inches

2.13 STONE FILL FOR GABIONS

A. Use sound, tough, durable aggregate for stone fill in gabion units with a minimum size of 4 inches based on U.S. Standard square mesh sieves. Ensure the stone is free of cracks, seams, and other defects that could increase deterioration or reduce its size.

B. The inclusion of objectionable quantities of dirt, sand, clay, and rock fines as determined by the Landscape Architect will not be permitted. Sound pieces of broken concrete, without protruding reinforcement, may be used in place of stone where approved by the Landscape Architect.

2.14 WIRE MESH GABIONS

A. Galvanized Steel Wire Mesh Gabions:

1. Use gabion basket units with non-raveling construction, fabricated from a triple twisted hexagonal mesh of hot-dipped galvanized steel wire with a minimum diameter of 0.118 inches after galvanization. Galvanize the steel wire before fabricating it into mesh.
2. Use gabion diaphragm and frame wire that meets or exceeds Federal Specification QQ-W-461H , with medium tensile strength and a Finish 5, Class III zinc coating of not less than 0.8 oz / sft of uncoated wire surface. Determine the weight of zinc coating by ASTM A90. Ensure coating uniformity equals or exceeds four 1-minute dips using the Preece Test; ASTM A239.
3. Use hexagonal mesh openings with a uniform size not exceeding 3-1/4 x 4-1/2 inches.
4. Use selvedge or perimeter basket frame wire of heavier gauge than the wire mesh, with a minimum diameter of 0.150 inches after galvanizing.
5. Wire used for lacing or as internal connecting wire within basket cells may be of soft tensile strength and of lighter gage with a minimum diameter after galvanizing of 0.0866 inches.

B. Polyvinyl Chloride (PVC) Coated Galvanized Steel Wire Mesh Gabions:

1. Use polyvinyl chloride coated gabion basket units with unraveling construction, fabricated from a triple twisted hexagonal mesh of hot dipped galvanized steel wire with a minimum diameter of 0.105 inches after galvanizing. Apply an additional PVC coating with a minimum thickness of 0.020 inches.
2. Galvanize and PVC coat the steel core wire before fabricating it into mesh.
3. Use core wire for all gabion diaphragm and frame components that meets or exceeds Federal Specification QQ-W-461H , possesses medium tensile strength, and has a Finish 5, Class III zinc coating of not less than 0.8 oz / sft of uncoated wire surface.
4. Use hexagonal mesh openings with uniform size measuring no more than 3-1/4 x 4-1/2 inches.
5. Use selvedge or perimeter basket frame core wire heavier gauge than the wire mesh, with a minimum diameter of 0.132 inches after galvanization and an overall diameter (core wire plus PVC coating) of 0.174 inches.
6. Coated wire used for lacing or as internal connecting wire within basket cells may be of soft tensile strength and an overall diameter (core wire plus PVC coating) of 0.127 inches.
7. Ensure the PVC-coated wire of all gabion components resists destructive effects from immersion in acidic, salt, or polluted water, ultraviolet light exposure, and abrasion. Retain these characteristics after at least 3,000 hours of testing according to ASTM G153.

C. Fabrication:

1. Fabricate gabions to allow assembly at the construction site into rectangular baskets of the sizes specified and shown on the Plans. Construct gabions as single units.
2. Weave gabion base, lid, ends, and sides into a single unit or connect one edge of these members to the gabion base so the strength and flexibility at the connection equals or exceeds that of the mesh.
3. Divide gabions equally with diaphragms of the same mesh and gauge as the body when the length exceeds 1-1/2 times its horizontal width, creating cells with lengths not exceeding the horizontal width.
4. Furnish gabions with the necessary diaphragms secured in proper position on the base in such a manner that, during assembly, no additional tying will be necessary.
5. Securely selvedge perimeter edges of the mesh forming the gabion so the joints formed by tying the selvedges match or exceed the strength of the mesh body.
6. Supply lacing or connecting wire in sufficient quantity to securely fasten all diaphragms and edges of the gabion.

2.15 GEOTEXTILE FILTER FABRIC

A. Use non-woven, needle-punched geotextile filter fabric composed of at least 85% by weight polyolefins, polyesters, or polyamides. Ensure the fabric resists chemical attack, rot, and mildew, and contains no tears or defects that adversely affect its physical properties.

B. Meet the following physical strength requirements for the fabric:

Physical Property	Test Procedure	Acceptable Test Result
Tensile Strength	ASTM D4632/D4632M	120 lbf
CBR Puncture Strength	ASTM D6241	300 lbf
Elongation	ASTM D4632/D4632M	50% min
Trapezoidal Tear	ASTM D4533/D4533M	50 lbf
Permittivity	ASTM D4491/D4491M	1.7 sec^{-1} min
Ultraviolet Degradation	ASTM D4355/D4355M	70% of minimum degradation strength retained after weathering for 500 hours
Apparent Opening Size	ASTM D4751	70 US Standard Sieve

C. Sew fabric seams with thread that meets the chemical and physical requirements above or bond seams by heat or cement. Ensure seam strength reaches at least 90% of the required tensile strength of the filter fabric in any principal direction.

2.16 BURLAP BAGS

A. Make bags with maximum dimensions of 18 x 24 inches and use ten (10) ounce burlap.

2.17 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers of turf and soil concrete grids include:

1. Mono Slabs by Fendt Builders Supply, Inc.
2. Landscape Architect approved equal.

B. Gabions:

1. Maccaferri Gabions, Inc.
2. Bekaert Steel Wire Corp.
3. Landscape Architect approved equal

C. Interlocking Precast Concrete Slope Pavers: Subject to meeting any requirements as shown on the plans or specified elsewhere.

1. Tri-lock Erosion Control System by American Excelsior Co.
2. Tri-lock Erosion Control System by American Excelsior Co.
3. Landscape Architect approved equal

PART 3 EXECUTION

3.1 VERIFICATION OF SUBBASE

A. Riprap and Slope Paving Materials:

1. Prior to the installation of any riprap or paving materials, examine the subbase to receive such material for the proper grades and lines required to receive the Work. Ascertain that subgrades and bedding are adequate to receive slope protection. Correct defects and deficiencies before proceeding with Work.

B. Geotextile Filter Fabric:

1. Prior to installation of any geotextile filter fabric, verify that the surfaces to receive fabric are prepared to relatively smooth grades, free of obstructions, depressions, debris and soft or low density pockets of material. Correct defects and/or deficiencies prior to installation of fabric so that fabric will not be damaged.

3.2 PREPARATION - GENERAL

A. Prepare surfaces to receive slope protection materials as indicated on the Plans and as specified herein.

3.3 BEDDING MATERIALS

A. Install bedding materials of the types indicated on the Plans and as required to receive the slope protection materials.

B. Remove buried debris protruding through the bedding material that will impede or damage the proper installation or affect the final appearance of the slope protection installations. Fill voids of installed bedding materials and compact as directed by the Landscape Architect.

C. Fill voids of installed bedding materials and compact as specified herein or as directed by the Landscape Architect.

3.4 EXAMINATION OF MATERIALS

A. Geotextile Filter Fabric:

1. Prior to installation, inspect geotextile filter fabric for defects, rips, holes, contamination or deterioration. Replace defective geotextile filter fabric as directed by the Landscape Architect.

B. Wire Mesh Gabions:

1. Prior to installation, inspect wire mesh gabions for defects or damage due to manufacture, handling or storage which would substantially affect gabion installation and performance. Replace defective or damaged wire mesh gabions as directed by the Landscape Architect.

3.5 INSTALLATION GENERAL

A. Spread bedding material uniformly on the prepared subbase to the slopes, lines, levels, and grades indicated on the Plans in a manner satisfactory to the Landscape Architect. Prevent segregation of bedding material particle sizes or damage to the prepared subbase during bedding.

B. Repair defective or damaged work to the satisfaction of the Landscape Architect.

C. Compact and finish bedding to present a reasonably even surface, free from mounds or windrows.

D. Install formwork for concrete headers, cast-in-place concrete slope paving, and weep holes for riprap paving as indicated on the Plans. Make forms the full depth of the concrete.

1. Firmly stake forms to the required line and grade.

2. Place slab division forms so slab division joints remain straight and continuous.

3.6 CONCRETE SLOPE PAVING

A. Construct concrete slope paving on the prepared subgrade to the lines, levels, and details indicated on the Plans. Thoroughly wet the prepared subgrade and deposit concrete to the proper depths. Place concrete in blocks with dimensions shown on the Plans. Place concrete in alternate blocks first, then pour remaining blocks after the first set is placed.

B. Do not place concrete unless the air temperature away from artificial heat is at least 25 degrees Fahrenheit and rising, unless otherwise allowed by the Landscape Architect.

C. Place no concrete against frost or frozen materials.

D. Do not place concrete when its temperature at the point of placement exceeds 90 degrees Fahrenheit.

E. Thoroughly spade concrete along the faces of forms before finishing operations are started. Alternately tamp and strike off concrete with a strike board until voids are removed and the surface reaches the required grade and cross section.

F. Finish the concrete surfaces with a wood float. Round edges and joints to a radius of 1/4 inch with an approved finishing tool.

G. Cure the concrete for a minimum of four days by keeping it continuously wet or by applying transparent membrane curing compound.

H. Protect the concrete from freezing until the concrete has attained at least 100 psi flexural strength.

I. Protect concrete against foot traffic for a minimum of 24 hours.

3.7 CONCRETE HEADERS

A. Construct cast-in-place concrete toe and side headers of the types, sizes and to the lines and levels indicated on the Plans.

B. Place, cure, and protect concrete headers as described herein.

3.8 GEOTEXTILE FILTER FABRIC

A. Place geotextile filter fabric on the prepared subbase in the manner and at the locations shown on the Plans. Lay fabric smooth and free of tension, stress, folds, wrinkles, or creases.

B. Place fabric strips with a minimum overlap of 24 inches at each joint. Position fabric so the upper strip overlaps the next lower strip. Install securing pins with washers through both strips along the midpoint of the overlap at center-to-center spacings recommended by the manufacturer unless otherwise shown on the Plans. Ensure washers bear against the fabric to secure it firmly to the subbase.

C. Install additional pins as needed to prevent slippage of the filter fabric. Use steel securing pins, minimum 3/16 inch in size, pointed at one end, with lengths recommended by the manufacturer unless otherwise shown on the Plans, but not less than 18 inches long. Use washers with an outside diameter of at least 1-1/2 inch.

D. Schedule the Work to cover the fabric with specified slope protection materials within seven days after placement. Replace fabric if this requirement is not met.

E. Protect filter fabric from damage by limiting the height of drop of slope protection material or by placing a cushioning layer of sand over the fabric before adding other material.

3.9 AGGREGATE FILTER DRAINAGE LAYERS

A. Install aggregate filter drainage layers in the locations and to the lines and levels indicated on the Plans.

B. Use aggregate for filter drainage layers with gradation as detailed.

C. Spread and compact aggregate as indicated.

3.10 PRECAST CONCRETE SLOPE PAVING

A. Lay precast concrete slope paving on a prepared subbase as indicated on the Plans unless otherwise specified. Begin laying units at the toe of slopes.

B. Create joints as detailed and fill them with mortar. Moisten edges of precast units before placing mortar. Place mortar from bottom to top, using enough to form solid joints. Use approved tools to fully fill joints between units. Remove excess mortar from the surface of precast concrete units.

C. Cure and protect precast concrete slope paving as specified herein.

3.11 PLAIN RIPRAP SLOPE PAVING

A. Place stone for riprap on the prepared subbase, starting at the toe of the slope and progressing upward. Lay each stone by hand. Arrange stones to create a reasonably well-graded mass with a minimum practicable percentage of voids.

B. Riprap along the lower edge of an area must consist of the largest stones.

C. Use no stone in the exposed face of the riprap that extends less than 1/2 the riprap thickness, except for small stones filling voids between larger stones. Place stones within the tolerances and to the lines and levels shown on the Plans.

D. Place riprap to full course thickness in one operation, avoiding displacement of the subbase.

E. Use larger stones that conform to the gradation indicated on the Plans and distribute them well over the area. Rearrange individual stones as necessary to achieve a reasonably well-graded distribution of stone sizes.

F. Thoroughly compact riprap and bedding during construction to provide an even, tight surface.

G. Place riprap protection immediately after completing the embankment.

3.12 GROUTED RIPRAP SLOPE PAVING

A. Carefully place riprap in the prepared subbase to the lines and levels indicated on the Plans, leaving joints between stones open to receive grout. Arrange stones to create a reasonably well-graded mass with a minimum practicable percentage of voids.

B. Construct weep holes in the riprap where indicated on the Plans by placing approved forms on the subbase and placing riprap around them. Fill weep holes with the material used for bedding of riprap and, during the grouting work, prevent mortar from entering the weep holes.

C. Thoroughly wet all riprap surfaces before grouting. Grout riprap in successive longitudinal strips approximately 10 feet wide, starting at the lowest strip and working up the slope.

D. Place each batch of mortar on the upper portion of the ungrouted strip and work it into voids between stones and down the slopes. Distribute grout over the strip surfaces using brooms, then work it between stones with spades, trowels, vibrators, or other approved equipment.

E. Take adequate precautions to prevent grout from penetrating the stone bedding material. Keep faces of riprap stones exposed.

F. Remove grout from the top surfaces of riprap stones and from pockets and depressions in the stone faces using a stiff stable broom or brush as a final operation.

G. Do not grout riprap when the ambient temperature is below 35 degrees Fahrenheit or above 85 degrees Fahrenheit, nor when the grout, without special protection, is subject to freezing temperatures before final set has occurred.

H. Protect grouted riprap surfaces from rain, flowing water and mechanical injury. Prohibit workmen and loads on grouted riprap surfaces for at least 24 hours.

3.13 GROUTED FLAGSTONE SLOPE PAVING

A. Place flagstone on the prepared subbase to the lines and levels indicated on the Plans. Wet the subbase before placing flagstone. Begin placing flagstone from the bottom of the slope and proceed upward in courses to the top.

B. Lay stones flat with smoother faces exposed. Lay stones with well-broken joints and minimal space between units. Sweep spaces between flagstone joints clean of sand and other materials to the full depth of the stones and fill them with mortar.

C. Wet the edges between stones and the subbase and keep surfaces damp when placing mortar. Place mortar to fill joints completely to the full depth of the stones, ensuring no mortar remains on top of the stones.

D. Fill each joint individually with mortar. Do not deposit mortar on top of stones and sweep it into joints. Finish the top surface of joints flush with stones, and remove excess mortar around joints or on stone faces using a stiff brush or other approved means.

E. Do not grout flagstone when the ambient temperature is below 35 degrees Fahrenheit or above 85 degrees Fahrenheit, nor when the grout, without special protection, is subject to freezing temperatures before final set has occurred.

F. Protect grouted flagstone surfaces from rain, flowing water and mechanical injury. Prohibit workmen and loads on grouted flagstone surfaces for at least 24 hours.

3.14 PRECAST CONCRETE GRID SLOPE PAVERS

A. Place grid slope pavers on a prepared subbase to the lines and levels indicated on the Plans. Begin placing pavers from the bottom of the slope and proceed upward in courses to the top. Lay the lowermost course of pavers with slab longitudinal members horizontal along the bank; lay succeeding courses to the desired height.

B. Provide and install wooden stakes of sufficient size to anchor slabs where indicated on the Plans and where necessary. Place stakes at the lowermost paving course, alternating two (2) or three (3) slab widths apart. After laying is completed, fill the interstices of slab grids with earth fill as specified on the Plans to within 1 inch of the top.

3.15 INTERLOCKING PRECAST CONCRETE SLOPE PAVERS

A. Clear areas receiving interlocking precast concrete slope pavers of obstructions such as tree roots, rocks, or other protruding objects or foreign materials.

B. Fill voids or soft areas with acceptable material and compact areas suitably. Perform hand dressing where necessary.

C. Lay interlocking precast concrete slope pavers on geotextile filter fabric. Install the geotextile fabric in stages.

1. Spread the geotextile at a maximum rate of 200 - 250 square yards or the portion of fabric covered by block during the workday.

2. Do not leave geotextile fabric exposed to U.V. for an extended period.

D. Anchor geotextile fabric using 12 inch x 3/16 inch pins with 1-1/2 inch diameter washers. Place pins at 2 foot intervals along edges and at 3 foot intervals in interior areas of the geotextile.

E. Overlap at seams a minimum of 24 inches.

F. Upper geotextile sections will overlap.

G. Begin installation of interlocking precast concrete slope pavers by placing blocks in a straight line perpendicular to the direction of lay. Continue installation sequentially, maintaining straight lines throughout.

H. Construct and backfill key, toe, and flank trenches as shown on the Plans.

I. When placement of interlocking precast concrete slope pavers is complete, fill voids in lower five feet of pavers with MDOT 21AA crushed limestone. Fill voids in remaining pavers with topsoil, seed, fertilizer, and mulch.

3.16 WIRE MESH GABIONS

A. Assemble empty wire mesh gabion units at the Work site strictly following the manufacturer's printed instructions. Allow no substitution for lacing wire specified in this Section or recommended by the wire mesh gabion manufacturer.

B. Place empty gabion units on the prepared subbase to the lines, levels, and grades indicated on the Plans. Place units with sides, ends and diaphragms erected to insure the correct position of all creases and that tops of all sides are level.

C. After installation, connect adjoining empty gabion units with tie wire lacing along contact perimeters to create a monolithic structure. Stitch adjoining basket units continuously with alternating single and double loops at intervals not exceeding 5 inches. Securely fasten lacing wire terminals. Do not use clip connections to close lids finally.

D. After the initial course of baskets are placed, partially fill them with stone to provide anchorage against deformation and displacement during filling operation.

E. After setting adjoining empty baskets to line and grade, and thoroughly lacing common sides with adjacent units, place units in tension and stretch to remove kinks in the mesh and achieve full, uniform alignment. Stretch empty basket units carefully to prevent wire mesh unraveling.

F. For gabion units 24 inches or more in depth, place a minimum of two (2) uniformly spaced connecting wires between each stone layer in all cells connecting compartment faces parallel to earth banks.

G. Loop connecting wires around one mesh opening at each basket face and securely twist wire terminals to prevent loosening. For gabion units over 4 feet in depth, provide a minimum of two (2) uniformly spaced vertical connecting wires per cell, linking foundation mesh to basket lid mesh.

H. Place and arrange the outer layer of stone by hand to ensure a neat and compact appearance along all exposed faces. Level the final layer of stone with the top of the gabion units for proper lid closing.

I. Stretch lids tight over the stone fill using suitable lid closing tools so the lid meets the perimeter edges of front and end panels. Lace all edges, ends, and internal cell diaphragms tightly.

J. Turn all wire projections into baskets. Where complete gabion units cannot be installed, cut, fold and wire baskets to suit site conditions.

K. Proceed carefully with stone filling operations using hand or machine methods that do not damage wire mesh coatings of the units. Assure placing methods minimize voids between stones.

L. Maintain alignment of gabion basket units throughout the filling operation. Avoid undue bulging or localized deformation by filling in 12 inches stages. Do not fill any cell to a depth exceeding 12 inches or more than adjoining cells. Limit maximum stone drops to 3 feet.

3.17 CONCRETE BAG RIPRAP

A. Place bags of unhardened concrete as indicated on the Plans, starting on the prepared subgrade at a concrete base at the toe of the slope and progressing upward. Construct the concrete base with a minimum width and thickness of 12 inches, embedding the end of the culvert 4 inches.

B. Ensure concrete is wet enough when placed into the bags so that bags adhere together and form a solid wall when set in place. Fill bags to 2/3 capacity.

C. Drive steel bars, 1/2 inch diameter and no less than 24 inches long, through the top row of bags at 12 inches on center. Do not allow bars to protrude from the bags.

D. Place a 4 inch thick concrete cap over the full width and length of the top row of bags.

E. Do not place concrete unless the air temperature away from artificial heat is at least 25 degrees F and rising, unless otherwise allowed by the Landscape Architect.

F. Place no concrete against frost or frozen materials.

G. Do not place concrete when its temperature at the point of placement exceeds 90 degrees Fahrenheit.

3.18 FIELD QUALITY CONTROL

A. Upon completion of the slope protection, perform final inspection. Check for proper placement and backfill of protection material, confirm slopes and elevations match the Plans, and verify completion of related earth work.

END OF SECTION

SECTION 31 50 00
EXCAVATION SUPPORT AND PROTECTION

PART 1 GENERAL

1.1 SCOPE OF WORK

A. The work specified in this Section includes initial ground support systems for trenches and near surface excavations for manholes, junction chambers, diversion structures, and miscellaneous concrete structures.

B. This Section does not apply to shafts or tunnel excavations.

C. Use the minimum designs of temporary excavation support systems for SCS-2-DS, SCS-2-GSS, E-01C-DV, E-10A-MH, E-12A-JN, E-13A-DV, E-18A-DV, and E-18A-JN as included in the Contract Drawings. Design temporary excavation support for all other near surface excavations.

1.2 RELATED SECTIONS SPECIFIED ELSEWHERE

A. Section 31 23 19 - Dewatering

1.3 REFERENCE STANDARDS

A. ASTM A36/A36M: Carbon Structural Steel

B. ASTM A53/A53M: Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

C. ASTM A307: Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength

D. ASTM A328/A328M: Steel Sheet Piling

E. ASTM A500/A500M: Cold-Formed Welded

F. ASTM A501/A501M: Hot-Formed Welded and Seamless Carbon Steel Structural Tubing

G. ASTM A572/A572M: High-Strength Low-Alloy Columbium-Vanadium Structural Steel

H. ASTM A690/A690M: High-Strength Low-Alloy Nickel, Copper, Phosphorus Steel H-Piles and Sheet Piling with Atmospheric Corrosion Resistance for Use in Marine Environments

I. ASTM A992/A992M: Structural Steel Shapes

J. ASTM F3125/F3125M: High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength

K. AWS D1.1/D1.1M: Structural Welding Code – Steel

L. AWPA C2: Lumber, Timber, Bridge Ties and Mine Ties Preservative Treatment by Pressure Processes

M. 29 CFR: US Department of Labor, Occupational Safety and Health Administration, Code of Federal Regulations Title 29 Labor

1.4 DEFINITIONS

A. Initial ground support system: the support installed prior to or concurrent with excavation to maintain stability of the opening until the excavation is closed.

B. Apply definitions of terms in OSHA 29 CFR, Subpart P - Excavations, 1926.650(b), in their entirety to this Section. The following terms are of particular interest to this Section: excavation, trench, protective system, support system, shoring system, sloping system, benching system, shield, trench box, cave-in, and competent person.

1.5 SUBMITTALS

A. Submit Contractor's designer and subcontractor qualifications a minimum of 30 days prior to the execution of the excavation. Demonstrate experience in designing and constructing at least three similar projects, including excavation support system types, depths, and ground and groundwater conditions.

B. Submit an excavation support plan stamped and signed by a Professional Engineer licensed in the State of Michigan at least 30 days before excavation begins. Include the following information in the plan:

1. Limits of working area, including minimum lateral distance from the edge of the excavation support system for construction equipment, stockpiled construction, and excavated materials.
2. Maintenance of traffic (if any).
3. Proposed excavation support systems, location, layout, depth, extent of the different types of support relative to existing features and projected structures, and methods and sequence of installation and removal (if applicable).
4. Design assumptions and calculations.
5. Member sizes and thickness, and bending tolerances of structural steel.
6. Connection details.
7. Maximum allowable spacing between bracing points on compression members to maintain stability and alignment.
8. For initial support members installed in advance of excavation, describe: methods of installation, of quality control, and of correcting support system defects exposed by subsequent excavation.
9. List and specifications sheets of equipment to be used for installation of the excavation support systems.
10. Quality of materials to be used (by reference to recognized standards such as ASTM), including but not limited to timber structural members, steel plates, and blocking; steel structural members, plates, and bars; concrete; and grout.
11. Monitoring schedule, installation procedures and location plans for vibration/noise monitoring, and geotechnical instrumentation.

C. For excavations utilizing Cement-Bentonite (C-B) Wall with Embedded Soldier Piles, submit the following:

1. Include description of methods of pre-trenching to clear debris prior to installing guide walls.
2. Provide details of guide walls.
    a. Submit complete descriptions of all equipment to be used in the trench excavation, and in the mixing, storing, circulating, pumping and placing the wall lagging material.
3. Clearances from adjacent and final structures including excavation tolerances.
4. Sequence and details of wall excavation and backfill, set time, and final strength.
5. Schedule of operations including anticipated times for mobilization, trench excavation, mixing, and backfilling the wall for each location.
6. Parameters and assumptions for the cement-bentonite mix including, but not limited to, the slurry density, viscosity, trench stability calculations, and C-B strength upon setting.
7. Location and methods of monitoring and testing cement-bentonite slurry mix to comply with specified requirements.
8. Method of excavating through boulders or other obstructions.
9. Method of monitoring plumbness and deviation of wall during excavation, and details of proposed corrective measures to be implemented if necessary.
10. Methods for checking and proving the cleanliness of trench bottoms prior to placement of soldier piles
11. Details for placement of soldier piles to be embedded in the walls.
12. Method of maintaining stability of excavated trenches in case of sudden loss of slurry suspension.
13. Measures for preventing slurry from entering utility facilities.
14. Method of protecting slurry operations, including storage, handling, and disposal, during all seasons.
15. Control of drainage, spills, wastes, etc.
16. Method of controlling/containing spoils, slurry, cement-bentonite, within the construction area.
17. Proposed cement-bentonite and/or lean mix concrete mix design.
18. Manufacture’s specifications for bentonite including laboratory test results.
19. Details of testing methods used to verify the effectiveness of mix design, with respect to strength, hydraulic conductivity criteria and acceptance criteria.

D. After construction, provide records of the following information:
    1. Panel and piles identifications
    2. Dates, times, and quantities of panel/pile excavation; end stop and soldier pile placement, if used; tremied concrete placement; and end stop removal, if used.

3. Plan location, deviation from plan location, and dimensions of the excavation.
4. Details and locations of any instrumentation installed.
5. Description of any variations from the Contract Drawings and Shop Drawings

E. For protective systems for trench excavations, submit, as applicable:

1. OSHA soil classifications used in design
2. Tabulated data used in design
3. For sloping and benching systems, submit trench configurations and maximum allowable slopes.
4. For shield systems, submit plan indicating the sizes, types, and configurations of structural components; lateral load capacity; and connection details, where shields are to be stacked.
5. For shield systems or support systems that are manufactured or pre-engineered, submit, in addition, specifications, recommendations, and limitations issued by the manufacturer; and manufacturer's written approval of any deviation from said specifications, recommendations, and limitations.

1.6 QUALITY ASSURANCE

A. Testing of bentonite slurry must be performed by the Contractor as required hereinafter with the results of every test submitted to the Contractor within the time limit specified herein. Use testing methods and equipment in accordance with API RP 13B-1.

1. Required Tests:
   a. Density, by mud density balance
   b. Viscosity, by Marsh Cone Method
   c. pH
2. Calibrate density measuring devices (e.g. Baroid scale) monthly, or more often if necessary, to ensure correct calibration.
3. Slurry sampling and testing: Collect slurry samples for testing in accordance with the requirements herein.

B. Slurry Trench Excavation Bottom Inspection: Measure and record the excavation bottom elevation in the presence of the Owner at the following stages to determine whether soil from trench or excavation sides, or other sediment, has collected:

1. Immediately after excavation to the final depth.
2. Immediately after each cleaning and desanding.

C. Perform testing and inspection of soldier pile and cast-in-place concrete in accordance with requirements specified elsewhere in the Contract Documents.

1.7 PERFORMANCE REQUIREMENTS

A. General:

1. Select methods of excavation and temporary excavation support systems that are compatible with conditions described in the Geotechnical Baseline Report (GBR) , and with requirements for placement of permanent structures, control of water, safety of personnel, and protection of adjacent property.
2. Provide lateral support, prevent loss of ground, limit ground displacements, and prevent damage to adjacent property (including utilities, structures, roadways, and other facilities) with temporary excavation support systems throughout the entire duration of excavation activities and until the final structures reach design strength.
3. Specific methods of initial ground support and groundwater control required in this Section or shown on the Drawings are acceptable support systems. Contractor is solely responsible for any additional construction measures necessary to achieve the requirements of this Section and is solely responsible for any damages resulting from failure to meet the requirements of this Section.

B. Tolerances:

1. Set out and construct temporary excavation support systems to maintain the minimum clear dimensions for permanent structures as shown on the Contract Drawings and provide adequate working space to construct the permanent structures.
2. Check the verticality of drilled soldier piles and C-B panels every 15 feet of depth during excavation of each element at a minimum. Keep vertical tolerance within 0.5% of the depth.
3. Limit the depth of the support of excavation system to within 1 ft of the planned depth, unless the Owner accepts a deviation to accommodate field conditions.

1.8 INITIAL GROUND SUPPORT SYSTEMS SHOWN ON DRAWINGS

A. Evaluate the initial support system designs shown on the Drawings and provide additional capacity as necessary to ensure full compatibility with the means and methods of construction.

B. Change the size and configuration of excavation from that shown on the Drawings to accommodate means and methods of construction, subject to approval by the Owner and compliance with minimum requirements and any limitations in the Contract Documents.

C. Contractor will be solely responsible for any revision of designs shown, and for design of all connections. Prepare and seal the design by a registered Professional Engineer licensed in the State of Michigan, with at least 5 years of experience designing similar support systems in similar ground conditions.

1.9 INITIAL GROUND SUPPORT SYSTEM DESIGN BY CONTRACTOR

A. Contractor will be solely responsible for design of initial ground support systems not shown on the Drawings. Prepare and seal the design by a registered Professional Engineer licensed in the State of Michigan, with at least 5 years of experience designing similar support systems in similar ground conditions.

B. Design initial ground support systems to the minimum ground loads, hydrostatic loads, and surcharge loads provided in the Geotechnical Baseline Report (GBR). Verify that ground loads and surcharge loads for design adequately reflect the expected ground conditions and suit the type of support system proposed. Add construction loads appropriate to the means and methods of construction.

C. Consider the following in the design of the initial ground support system:

1. Ground conditions described in the Geotechnical Baseline Report (GBR) .
2. Methods for control of surface and ground water.
3. Maintenance of soil stability at the bottom of the excavation.
4. Deformation of the support system under load.
5. The proximity of existing underground and above-ground structures, including buried water lines and gas lines, and the potential effect of their rupture.
6. Effects of vibration on adjacent structures, from driving and pulling support elements.
7. Loading conditions, including loading due to delay in adding support members, removal of support members, and dynamic loading.
8. Placement of permanent lining and structures.

1.10 TRENCH EXCAVATIONS

A. Conform protective systems for trench excavation to OSHA 29 CFR Subpart P, Section 1926.652. Include sloping and benching systems, shield systems, and support systems as defined in Section 1926.652.

B. Shield and support systems pre-manufactured and sold in interstate commerce may be used, provided they are selected as appropriate for the Work by a Professional Engineer licensed in the State of Michigan.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Steel Pile:

1. Use structural steel piles as rolled steel sections of the weight, shape, and length shown. Ensure the material in steel piles meets the requirements of ASTM A572/A572M or ASTM A690/A690M. Maintain a minimum yield point of 50,000 psi.
2. Make splices in steel piles by a full penetration butt weld of the entire cross section. Properly align adjacent sections to keep the pile axis straight. Do not allow splices in the top 10 feet of the piles. Perform all welding by qualified welding operators.

B. Timber Lagging:

1. Grade wood for an extreme fiber stress of at least 1,000 psi. Use timber dimensions of 4”x6” nominal with a maximum length of 8’-0”. Use Spruce-Pine-Fir, Mechanically Graded, or equal for timber lagging material.

C. Internal Bracing System:

1. Structural steel: Use structural steel for walers, struts, pile bracing, points, caps, and splices as follows.

a. Wide Flange Shapes: ASTM A992/A992M

b. Other Shapes, Plates, Bars: ASTM A36/A36M

c. Pipe, Pipe Columns, Bollards: ASTM A53/A53M, Type E or S, Grade B standard weight unless noted otherwise

2. Structural HP Shapes: ASTM A572/A572M, Grade 50

a. HSS: ASTM A500/A500M ,Grade B

3. Use bolts for connections per ASTM F3125/F3125M, unless indicated otherwise. Use bolts to connect dissimilar metals per ASTM A193/A193M and ASTM A194/A194M, Type 316 stainless steel.

D. Furnish structural members full length without splices unless otherwise indicated or approved by the Owner.

E. Cement-Bentonite Slurry:

1. Portland Cement: ASTM C150/C150M, Type I or Type II.

EXECUTION

3.1 GENERAL

A. Construct initial ground support systems to line, grade, dimensions, and tolerances that allow permanent structures and pipes to be placed as shown on the Drawings and in accordance with specified tolerances. Do not let initial support systems project into the limits of the permanent structure.

B. Supplement the support system as designed to address variations in ground conditions as they are exposed in the excavation.

C. Install and remove support members following the sequence of operations shown on the Contractor’s design drawings.

D. Develop and maintain firm and uniform bearing of the support system against the ground by advancing the support system in advance of excavation, by timely placement of internal supporting members, by expanding the support system tightly against the ground, or by timely backfill grouting between a non-expanding support system and the ground.

E. Periodically examine initial ground support systems in place to identify loosening or instable ground; loss of ground through the support system; or excessive deformation, overstress, or weakening of the support system.

F. Maintain the initial ground support system in fully functional condition for the duration of its use. Promptly reset, repair, or replace support system elements that settle, become misaligned, were improperly installed, or become damaged.

3.2 INITIAL GROUND SUPPORT SYSTEMS IN SOIL

A. Use steel piles (soldier piles) and wood lagging, timber sheeting and bracing, steel ribs and timber lagging, steel ribs and steel liner plates, or comparable systems for initial ground support systems in structure excavations in soil.

B. Do not use driven or vibrated sheeting.

C. Install bracing members called for in the initial ground support system design within 5 feet of the current excavation bottom in shafts, unless otherwise shown on the Drawings.

D. Coordinate the installation of initial support systems with excavation to prevent heaving or raveling of exposed soils.

3.3 STEEL PILES

A. Install steel piles by pre-drilling or other pre-excavating methods to their proposed tip elevations. Impact and vibratory driving for steel pile installation is prohibited.

B. Keep equipment on-site able to advance the pre-excavated hole for installing steel piles through obstructions in the fill and native soils.

C. Within the same day of seating the steel piles in the pre-excavated holes, completely backfill the holes and fully encase the steel piles with concrete of class as specified in the Contract Documents from the pile tip to the ground surface.

D. Leave steel piles in place after completing structure construction and excavation backfilling, and cut them off at least three (3) feet below finished grade, unless specified otherwise in this Section.

3.4 TIMBER LAGGING

A. Install lagging with louvered openings (gaps) between boards in accordance with ground conditions encountered in excavations and subject to the approval of the Owner. In no case will the louvered openings be allowed to exceed one (1) inch.

B. Pack louver openings between lagging with filter fabric, hay, excelsior, jute matting, or other porous material to allow free drainage of groundwater without loss of retained soil or backpacking.

C. Limit the maximum permissible height of unlagged (unsupported) face of excavation to three (3) feet. Reduce the maximum height of unlagged face to eight (8) inches if water flows from the face of the excavation or if soil to be retained moves toward the excavation.

D. If unstable ground is encountered, take suitable measures (Backfill Grouting or other approved method) to retain the material in-place and prevent loss of ground or movements which may cause damage to adjacent structures or utilities.

3.5 PRE-EXCAVATION AND GUIDE WALL CONSTRUCTION

A. Before commencing cement-bentonite trench, hand or vacuum excavate as required to expose all utilities known to cross or suspected of crossing the footprint of the proposed excavation and to determine the locations of potentially unknown utilities.

B. Pre-excavation (Pre-trenching): Pre-excavate the alignment of the wall to a minimum depth of 10 feet from the top of the wall prior to commencing guide wall construction to

remove obstructions, rubble, loose fill, and unsuitable materials. Make the width of the pre-excavation zone at least twice the thickness of the C-B wall. Backfill the zone with stable, excavatable material that meets the clean fill criteria required elsewhere in the Contract Documents. Support the pre-excavation according to the requirements specified elsewhere in the Contract Documents.

C. Construct guide walls as continuous, cast-in-place reinforced concrete on a stable subgrade. Remove fill debris at the guide-wall bearing surface or stabilize the ground to provide a stable bearing. Use suitable temporary internal bracing or other stabilizing measures to prevent guide wall movement.

D. Protection: Protect existing or new construction, utilities, roadways, walkways, or other facilities whenever their safety appears endangered.

3.6 CEMENT-BENTONITE WALL INSTALLATION

A. Panel Excavation:

1. Layout and measure panels taking as reference the outside face of the permanent structures as shown on the Contract Drawings and including the anticipated installation tolerances.

2. Excavate trenches using clamshell, hydromill, or other suitable trenching equipment. Ensure the excavating tool has a minimum width equal to the specified trench width.

3. Maintain the stability of the excavated trench at full depth at all times.

4. Maintain cement-bentonite slurry in workable condition until completing the panel excavation.

5. Remove any deleterious sediment that settles out of the slurry or falls to the bottom of the trench using the excavating tool or other suitable equipment.

6. Check the verticality of the panel during panel excavation at a minimum of 15-foot intervals and make modifications to the excavation procedures as required to maintain verticality and meet the clear dimensions shown in the Contract Drawings.

7. Take all necessary measures to prevent collapse of the excavated slurry trench prior to cement placement. In the event collapse occurs, backfill with lean concrete and re-excavate per approved method.

B. Slurry Mixing and Placing:

1. Prepare bentonite slurry by mixing water and bentonite until the bentonite particles fully hydrate and the slurry appears homogeneous.

2. Blend cement thoroughly into the slurry until the mix is homogeneous and cement particles fully disperse in the bentonite slurry.

C. Introduce slurry into the trench at the same time trenching begins and maintain the slurry level in the trench during excavation.

1. Begin continuous excavation once the cement-bentonite slurry is introduced into the trench. Do not disturb the panel or join it with a new panel for at least 48 hours or until the hardened cement-bentonite becomes self-supporting.

2. Allow leaving a panel open over a weekend or holiday, provided slurry levels in the panel are monitored and maintained at all times.
3. Maintain a reserve supply of mixed bentonite slurry equal to 25 percent of the volume of one fully excavated panel. Base the size of the slurry reserve volume on the largest panel if panel sizes vary.

D. Key:

1. Follow the Contract Drawings for the bottom of the slurry trench unless directed otherwise. Measure and check the final depth and penetration of the trench immediately after excavation, and obtain approval from the Owner immediately following excavation.

E. Continuity Between Trench Segments:

1. Any time that a trench segment is extended where the slurry in the previously excavated trench has set, the excavation tools will be arranged to re-excavate a minimum 24 inches overlap into the end of the previously excavated trench, measured at the ground surface.

F. Trench Top Treatment:

1. Check the top of the completed trench for free water or surface depressions after initial slurry hardening. Remove any free water and fill the trench with slurry to the specified elevation. After the initial set of this additional slurry, cover the top of the trench with material to prevent drying. Do not place cover material until the Contractor and the Owner inspect the trench.

G. Clean-Up:

1. Stockpile or dispose of material excavated from the trench per the Contract Documents. Clean the work surface of all excess slurry after completing the slurry trench.

3.7 INTERNAL BRACING SYSTEM

A. Install and maintain support members in tight contact with each other and with surface being supported.

B. Brace structural members adequately against buckling with a factor of safety of at least 1.5 for maximum axial loading conditions, including temperature effects.

C. Where required, pre-load bracing members in accordance with methods, procedures and sequence as described on accepted Shop Drawings. Coordinate excavation work with installation of bracing and preloading. Use steel shims and steel wedges, welded or bolted in place, to maintain preloading force, where required, in bracing after release of jacking equipment pressure.

3.8 REMOVAL OF INITIAL GROUND SUPPORT SYSTEMS

A. Remove support or bracing members only if the removal is sequenced with backfill operations or the construction sequence for casting the final lining. Install rebracing as needed and in accordance with the Contract Documents.

B. Remove support elements in a manner that maintains soil stability and strength, and avoids disturbing adjacent utilities and structures. Backfill voids left during removal to prevent subsidence.

C. Support elements may be left in place at Contractor's expense and with the written approval of the Owner, provided that the top 3 feet below final grade is removed. Provide additional clearance as necessary for new or relocated utility lines or other structures.

3.9 CONTROL OF VIBRATIONS

A. Contractor will be responsible for adverse effects of vibrations from installing the support systems, regardless of compliance with vibration and air overpressure limits specified herein. Do not exceed ground vibration or air overpressure limits under any circumstances.

B. Conform vibration limits and noise limits to the requirements specified elsewhere in the Contract Documents.

C. Use monitoring equipment that conforms to requirements specified elsewhere in the Contract Documents.

D. Contractor will be responsible for monitoring noise and vibration from construction operations.

END OF SECTION

SECTION 32 01 90
MAINTENANCE OF PLANTED AREAS

PART 1 GENERAL

1.1 SCOPE OF WORK

A. The work specified in this Section consists of the maintenance and establishment of the planted areas in accordance with these specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 32 90 00 - Plantings

B. Section 32 92 19 - Seeding

1.3 QUALITY ASSURANCE

A. Apply herbicides using a Michigan Department of Agriculture & Rural Development licensed pesticide applicator. For wetland applications, license the applicator in Category 5 (aquatic); other applications may use a Category 2 (forestry) or Category 6 (right-of-way) license. Submit evidence of licensing for each applicator.

B. Obtain any necessary Michigan Environment, Great Lakes and Energy (EGLE) aquatic Nuisance Control Permit for applications near or adjacent to water.

C. Contractor is required to complete, as a minimum, one (1) maintenance event per month during the growing season, which is April 25 – October 26.

1. Notify Owner at least 24-hours in advance of performing onsite maintenance activities.

2. A written summary of the maintenance activities will be submitted to Landscape Architect with each invoice, including photographic documentation of the work performed.

3. Invoices will be processed for the year at the end of the growing season.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 WORK TO BE PERFORMED

A. Maintain the survival level of planted vegetation at 90% or greater during the maintenance period.

1. Conform replanting of all herbaceous and woody plants, trees, or shrubs to the requirements of the planting specifications.

2. Submit a summary of installed replants to Landscape Architect in the monthly maintenance report. File monthly maintenance reports during the growing season of the maintenance and establishment period.

B. Effectively remove undesirable species within the maintenance area. At any time during the maintenance and establishment period, ensure undesirable species presence in area coverage remains at 10% or less. Undesirable species include the following invasive plants:

1. Black Locust (*Robinia psuedoacacia)*
2. Tree-of-Heaven (*Ailanthus altisima)*
3. Multiflora Rose (*Rosa multiflora)*
4. Honeysuckle (*Lonicera japonica)*
5. Japanese Knotweed (*Polygonum cuspidatum)*
6. Giant Reed (*Phragmites australis)*
7. Buckthorn (*Rhamnus cathartica-frangula)*
8. Autumn Olive (*Elaeagnus umbellata)*

C. Remove undesirable plants by hand whenever practical, or as specified in specific specification sections and permits. Remove and properly dispose of all undesirable plant material at the Contractor's expense. No additional compensation will be made for this item during the maintenance period.

D. If herbicides will be required within 50-feet of the Flint River, apply only herbicides labeled for application in aquatic sites.

E. Perform proper selective herbiciding procedures by a trained and registered aquatic applicator, licensed in accordance with the applicable commercial laws/regulations of the State of Michigan.

1. Do not apply herbicide during the target plant's dormancy.

F. No sooner than two (2) weeks from the herbicide application date, completely remove and properly dispose of the dead vegetation of the undesirable species off-site.

G. Furnish and apply other material, including water and accessory items, as may be required to facilitate the continued establishment and success of grass, plants, trees, and shrubs specified for maintenance.

H. Prune plants, trees, and shrubs specified for maintenance, including removing and properly disposing of the pruned plant material at Contractor's expense.

I. Once seeded area(s) are well established, and at the direction of Landscape Architect or Owner, furnish and supply labor and equipment to mow the seeded area(s) a minimum of one (1) time(s) per season.

3.2 CONDITIONS AND REQUIREMENTS

A. Plan for a minimum of four (4) supplemental watering events during the growing season. Supplemental watering of planted area(s) may be required depending upon weather conditions antecedent to, during, and after plant installation or seeding.

1. No additional compensation will be provided for watering during the maintenance and establishment period unless Landscape Architect specifically requests additional watering.

2. Perform supplemental watering with a slow-release hose or other device. Allow the water to soak the soil at the plant material's root zone; prevent runoff and erosion.

B. Ensure undesirable vegetation presence is maintained at or below 10 ercent coverage of the landscaped area for the maintenance period.

C. Seed the planted areas as indicated on the planting plan. Define successful seeding at two points: (1) initially, within 14 days of seeding, a healthy stand of cover crop has germinated; and (2) growing to provide cover over a minimum of 80% of the area seeded. Condition seeding success during the maintenance and establishment period on permanent seed species germinating and growing at the end of the first-year growing season, establishing a uniform matrix of permanent plant material with minimal (i.e., less than 15%) non-established areas in the planting area. If, at the end of either period, a uniform stand of the desired species is not established, re-seed and mulch the area at Landscape Architect's direction at no additional cost to Owner.

D. Warrant plant material - including grass, plants, trees, and shrubs - for one (1) year during the maintenance and establishment period. Make sure warranted plant material maintains satisfactory health at the end of the maintenance period, as determined by Landscape Architect's project acceptance and final payment of the Maintenance and Establishment Period invoice. If 25% or more of the warranted plant material is dead or considered dead by Landscape Architect prior to the end of the maintenance period, replace the dead material at no charge. Replant with live plant material during the appropriate season.

   1. Consider a tree dead when the main leader has died back, or if 25% or more of the crown is dead.

   2. Predation from animals does not relieve the Contractor from replacing plant material. Replant and provide protection to the plant material.

END OF SECTION

SECTION 32 11 23
AGGREGATE BASE COURSES

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section includes aggregate base courses complete with aggregate materials constructed in preparation for paving or aggregate surfacing.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 89 00 - Site Construction Performance Requirements

C. Section 31 23 13 - Subgrade Preparation

D. Section 32 12 16 - Bituminous Paving

1.3 REFERENCE STANDARDS

A. Unless otherwise specified, conform the work for this section to the applicable portions of the following Standard Specifications.

1. ASTM D98: Standard Specification for Calcium Chloride
2. ASTM D1557: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))
3. Michigan Department of Transportation (MDOT), Standard Specifications for Construction, latest edition

1.4 ALLOWABLE TOLERANCES

A. Shape the finished surface to conform to plan grade and cross section within a tolerance of 3/4 inch in 10 feet.

1.5 TEST REPORTS

A. The testing lab must provide the Landscape Architect with two (2) certified copies of the test results of the thickness of the compacted aggregate. The core drilling, testing for thickness and the certification of the test results must be performed by a testing laboratory approved by the Landscape Architect.

1.6 STOCKPILING AGGREGATE

A. Deposit aggregate in stockpiles. Remove material from stockpiles using methods that provide aggregate with uniform gradation.

B. Stockpiling of aggregate, in excess of 4 feet in depth, on the completed subbase or aggregate surface will not be permitted, except with the approval of the Landscape Architect.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Comply with the requirements for aggregate base or surfacing installations due to outside ambient air temperatures specified in Part 3 of this Section.

PART 2 PRODUCTS

2.1 DENSE-GRADED AGGREGATE

A. Dense-graded aggregate gradation to conform to Class 21 and 22, as specified in MDOT Section 902.05.

2.2 CALCIUM CHLORIDE ADDITIVES

A. Calcium chloride additives to conform to ASTM D98 and as specified in MDOT Section 922.12.

2.3 WATER

A. Use reasonably clean water for compaction and dust control; ensure it is free from substances injurious to the finished product. Use potable water from Michigan State Department of Public Health-approved sources.

PART 3 EXECUTION

3.1 EXCAVATION VERIFICATION

A. Prior to the placing of any aggregate material, examine the excavation for the grades, lines, and levels required to receive the new Work.

B. Ascertain that excavation and compacted subgrades or subbases are adequate to receive the new Work.

C. Correct defects and deficiencies before proceeding with the Work.

3.2 SUBGRADE CONDITIONS

A. Prior to the placing of any aggregate material, examine the subgrade or subbase to ascertain that it is adequate to receive the aggregate to be placed.

B. If the subgrade or subbase remains wet after all surface water has been removed, the Landscape Architect may require the installation of edge drain.

3.3 EXISTING IMPROVEMENTS

A. Investigate and verify locations of existing improvements, including structures, to which the new Work will be in contact. Necessary adjustments in line and grade, to align the new Work with the existing improvements must be approved by the Landscape Architect, prior to any changes.

3.4 PREPARATION OF SUBGRADE OR SUBBASE

A. Fine grade subgrade or subbase to the cross section indicated on the Plans. Compact it thoroughly prior to placing the aggregate material.

3.5 INSTALLATION - GENERAL

A. Indicate width, thickness, and type of aggregate materials on the Plans or as directed by the Landscape Architect.

B. Do not place aggregate material until the Landscape Architect approves the subgrade, subbase, or existing aggregate surface.

3.6 INSTALLATION OF AGGREGATE BASE COURSE

A. Place aggregate base course with a mechanical spreader or other approved means. Spread it in uniform layers to a depth that, when compacted, achieves the thickness shown on the Plans.

B. Compacted, the depth of any one layer must not exceed 8 inches. If unable to achieve required compaction for the full aggregate base course depth, reduce the thickness of each course. Alternatively, with Landscape Architect's approval, use adequate equipment to compact the aggregate to the required unit weight.

C. Shape the subgrade or subbase to the specified crown and grade. Maintain it in a smooth condition. If hauling equipment causes ruts or holes, do not permit it on the subgrade or subbase; operate it on the aggregate base course behind the spreader instead.

D. Compact aggregate to at least 95% of maximum unit weight by the use of approved pneumatic-tired compaction equipment or vibratory compactors.

E. Maintain optimum moisture content until achieving the prescribed unit weight. Compact each layer until attaining the maximum unit weight before placing the succeeding layer.

F. When approved by the Landscape Architect, additional water may be applied to the aggregate by an approved means to aid in the compaction and shaping of the material.

G. Use motor graders, trimmers, or other approved equipment to shape and maintain the aggregate base course until placing the surface course.

H. Limit the weight and speed of equipment when hauling material over the base course, subbase, or subgrade to avoid damage. If operations cause rutting in the subgrade, subbase, or aggregate base course, remove and replace the damaged sections until acceptable to the Landscape Architect, at the Contractor's expense.

I. With the approval of the Landscape Architect, chloride additives may be used by the Contractor to facilitate compaction and maintenance of the aggregate surface. The amount and method of combining the chloride additives are at the option of the Contractor and are at Contractor's expense.

3.7 MAINTENANCE DURING CONSTRUCTION

A. Continuously maintain aggregate base course and aggregate surface in a smooth and firm condition during all phases of the construction operation.

B. Provide additional materials at the Contractor's expense to fill depressions or bind the aggregate.

3.8 TEMPERATURE LIMITATIONS

A. Do not place aggregate materials when indications show the mixtures may freeze before reaching maximum unit weight.

B. Do not place aggregate on a frozen subgrade or base course unless approved by the Landscape Architect.

3.9 TESTING

A. Landscape Architect may require testing for compaction, density, and thickness of material during the course of the Work. Perform required testing and coring through a

testing laboratory acceptable to the Owner and approved by the Landscape Architect. Charge the cost for testing and coring to the Owner.

B. Make a minimum of one depth (thickness) measurement every 400 feet per traffic lane when performing thickness tests. Use the lane width indicated on the Plans or as determined by the Landscape Architect.

1. If two (2) lanes are constructed simultaneously, only one test is necessary to represent both lanes.

2. For areas such as intersections, entrances, cross-overs, ramps, widening strips, acceleration and deceleration lane, at least one depth measurement will be taken for each 1200 square yards of such areas or fraction thereof.

C. Location of the depth measurement will be at the discretion of the Landscape Architect.

D. Understand maximum unit weight to mean the maximum unit weight per cubic foot as determined by ASTM D1557, Method A.

3.10 DEFECTIVE WORK

A. Thickness:

1. Measurements of aggregate base course thickness will be made to the nearest 1/4 inch.

a. Allow depths to be 1/2 inch less than the thickness indicated on the Plans, provided the average of all measurements taken at regular intervals equals or exceeds the specified thickness.

b. In determining the average in place thickness, measurements which are more than 1/2 inch in excess of the thickness indicated on the Plans will be considered as the specified thickness plus 1/2 inch.

2. Specify locations of depth measurements as stated herein unless the Landscape Architect determines otherwise. Correct sections deficient in depth using methods approved by the Landscape Architect.

B. Weight

1. When the aggregate material is measured by weight in tons, the pay weights for aggregates will be the scale weight of the material, including admixtures, unless the moisture content is more than 6 percent .

a. Moisture tests will be made at the start of weighing operations and at any time thereafter when construction operations, weather conditions or any other cause may result in a change in the moisture content of the material.

b. If the tests indicate a moisture content in excess of 6 percent, the excess over 6 percent will be deducted from the scale weight of the aggregate until such time as moisture tests indicate that the moisture content of the material is not more than 6 percent.

END OF SECTION

SECTION 32 13 13
CONCRETE PAVING

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section includes both plain and reinforced portland cement concrete paving complete with concrete material admixtures, joints, forms, equipment requirements, field quality control and appurtenances required to complete the portland cement concrete paving Work indicated on the Plans.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 50 00 - Temporary Facilities and Controls

C. Section 31 23 13 - Subgrade Preparation

D. Section 31 23 19 - Dewatering

E. Section 32 11 23 - Aggregate Base Courses

F. Section 32 17 23 - Pavement Markings

G. Section 32 92 19 - Seeding

H. Section 32 92 23 - Sodding

1.3 REFERENCE STANDARDS

A. AASHTO M 33M - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)

B. AASHTO M 324 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

C. AASHTO T 26 - Standard Method of Test for Quality of Water to Be Used in Concrete

D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

E. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement

F. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement

G. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

H. ASTM C33/C33M - Standard Specification for Concrete Aggregates

I. ASTM C94/C94M- Standard Specification for Ready-Mixed Concrete

J. ASTM C143/C143M- Standard Test Method for Slump of Hydraulic-Cement Concrete

K. ASTM C150/C150M- Standard Specification for Portland Cement

L. ASTM C172/C172M- Standard Practice for Sampling Freshly Mixed Concrete

M. ASTM C260/C260M- Standard Specification for Air-Entraining Admixtures for Concrete

N. ASTM C309- Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

O. ASTM C494/C494M- Standard Specification for Chemical Admixtures for Concrete

P. ASTM C618- Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

Q. ASTM C989/C989M- Standard Specification for Slag Cement for Use in Concrete and Mortars

R. ASTM D98 - Standard Specification for Calcium Chloride

S. ASTM D994/D994M- Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)

T. ASTM D1751- Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

U. ASTM D5893/D5893M - Standard Specification for Cold Applied Single Component Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements

V. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

W. American Concrete Paving Association

X. MDOT - Michigan Department of Transportation, Standard Specifications for Construction, latest edition

1.4 MATERIAL REPORTS

A. Provide certification to Landscape Architect, upon request, that the various materials to be used conform to the standards referred to in the Specifications.

B. Submit a list of material supply sources for review prior to placing any order.

C. Provide Landscape Architect with the mix design, as required by ASTM C94/C94M, prior to the actual delivery of the ready-mixed concrete.

1.5 THICKNESS AND COMPRESSIVE STRENGTH REPORTS

A. Contractor to make sure the testing lab provides Landscape Architect with two (2) certified copies of the test results for the thickness and compressive strength of the concrete. Perform core drilling, testing for thickness and compressive strength, and certification of results through a testing laboratory approved by Landscape Architect.

1.6 WATER QUALITY TEST REPORTS

A. Contractorto make sure the testing lab provides Landscape Architect with two (2) certified copies of the test results for the quality of water to be used in the concrete. Conduct sampling and testing of water quality in accordance with AASHTO T 26

requirements, and have the certification of test results performed by a testing laboratory approved by Landscape Architect.

1.7 REQUEST FOR MATERIAL VARIANCE

A. Make all requests for variances in the materials, as specified, in writing to Landscape Architect.

B. Submit two (2) copies of the request for the Landscape Architect's review and approval.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Comply with the requirements for concrete installation due to outside ambient air temperatures specified under Part 3 of this Section.

B. Comply with the requirements for protecting new Work against damage from rain, as specified under Part 3 of this Section.

C. Comply with the requirements for protecting new Work against damage from cold weather, as specified under Part 3 of this Section.

PART 2 PRODUCTS

2.1 CEMENT

A. Use low alkali, air-entraining Portland cement conforming to ASTM C150/C150M, Type IA or Type IIIA.

2.2 FINE AGGREGATES

A. Ensure the fine aggregate gradation conforms to ASTM C33/C33M and to fine aggregate, 2NS, as specified in MDOT, Section 902.08.

2.3 COARSE AGGREGATE

A. Ensure the coarse aggregate gradation conforms to ASTM C33/C33M and to coarse aggregate, 6A, or 6AA as specified in MDOT, Section 902.03.

2.4 WATER

A. Use water for mixing and curing concrete that is reasonably clean and free from oil, salt, acid, alkali, sugar, vegetable matter, or other substances injurious to the finished product.

B. Waters from sources approved by the Owner as potable may be used without testing.

C. Test water requiring testing in accordance with the current Method of Test for Quality of Water to be Used in Concrete, AASHTO T-26, and as specified in MDOT, Section 911.

2.5 CONCRETE ADMIXTURES

A. Air-Entraining Admixtures:

1. Use air-entraining admixtures for concrete that conform to ASTM C260/C260M and as specified in MDOT, Section 903.01.

B. Concrete Accelerators:

1. Use chemical admixtures, other than calcium chloride, for accelerating the set of Portland cement concrete that conform to ASTM C494/C494M, Type C or Type E.
2. Use calcium chloride in flake or pellet form that conforms to ASTM D98, Type S, Grade 1 or grade 2, flake or pellet form, and as specified in MDOT, Section 903.04.
3. Use calcium chloride in solution form that conforms to MDOT, Section 903.04.

C. Water-Reducing and Water-Reducing Retarding Admixtures:

1. Use water-reducing admixtures and water-reducing retarding admixtures that conform to ASTM C494/C494M, Type A or Type D, without containing calcium chloride, and as specified in MDOT, Section 903.02.

D. Pozzolanic Admixtures:

1. Use Fly Ash that conforms to ASTM C618, Type F, and as specified in MDOT, Section 901.07.
2. Use ground granulated blast furnace slag that conforms to ASTM C989/C989M, Grade 100, minimum.

2.6 CONCRETE CURING COMPOUNDS

A. Use white membrane curing compound for curing concrete that conforms to ASTM C309, Type 2, Class B Vehicle, and as specified in MDOT, Section 903.06.

B. Use transparent membrane curing compound for curing base course concrete that conforms to ASTM C309, Type 1-D, Class B Type 1-D, Class B Vehicle, and as specified in MDOT, Section 903.06.

2.7 LANE TIE BARS

A. Use bar reinforcement for pavement tie bars that conforms to ASTM A706/A706M, or ASTM A615/A615M, Grade 60, and as specified in MDOT, Section 914.09.

2.8 STEEL WELDED WIRE FABRIC

A. Use welded steel wire fabric for concrete mesh reinforcement that conforms to ASTM A1064/A1064M, and as specified in MDOT Section 905.06. Fabricate the mesh as shown on the Plans.

2.9 DOWEL BARS

A. Use dowel bars and basket assemblies for transverse expansion and contraction joints that conform to ASTM A615/A615M Grade 40 and MDOT Section 914.07.

2.10 STEEL HOOK BOLTS

A. Use hook bolts that conform to ASTM A706/A706M, Grade 60 of ASTM A615/A615M, or ASTM A996/A996M., with a diameter of 5/8 inch. Use expansion anchored hook bolts along the edge of existing concrete.

2.11 JOINT FILLERS

A. Use fiber joint filler material for expansion joints that conforms to ASTM D1751, and as specified in MDOT, Section 914.03.

B. Use bituminous premolded joint filler material that conforms to ASTM D994/D994M and AASHTO M33M.

C. Use polyethylene premolded joint filler for pressure relief joints made from a flexible, low-density, expanded, extruded polyethylene plank. Form the plank by expanding polyethylene base resin through an extrusion process, ensuring it is homogeneous, closed-cell, and multi-cellular.

2.12 JOINT SEALANTS

A. Use hot-poured type joint sealant that conforms to AASHTO M324 or ASTM D6690 Type II and as specified in MDOT, Section 914.04.

B. Use cold-applied, single component type joint sealant that conforms to ASTM D5893.

2.13 CONCRETE MIX

A. Ensure concrete yields a minimum compressive strength of 3500 PSI when cured in a moist room at a temperature between 65 to 75 degrees F for a period of 28 days.

B. Use a nominal 564 lbs/cyd mix with a minimum of 25% Type F Fly Ash. Provide documentation from actual project mixes showing 28-day compressive strength of at least 3500 PSI when tested under field conditions.

1. Use water reducers, additional fly ash, ground granulated blast furnace slag (GGBFS), and other pozzolans only when approved by Landscape Architect. Limit fly ash quantity to a maximum of 40%; maintain GGBFS quantity between 25% and 40%.

2. Limit total cement replacement to a maximum of 40%. Replace cement with GGBFS and Fly Ash on a pound-for-pound basis.

C. Use air-entraining Portland cement ASTM C150/C150M, Type IA. Use Type IIIA when high-early strength concrete is required.

D. Use high early strength concrete with 4500 PSI, 658 lbs/cyd, and a water reducer. Maintain a water-cement ratio between 0.38 and 0.39.

E. Adjust the air content of the concrete based on the maximum size aggregate as follows:

Maximum Size of Aggregate	**Air by Volume (%)**
1-1/2 to 2-1/2 inch	5
3/4 to 1 inch	6
3/8 to 1/2 inch	7-1/2

F. Maintain the slump of the concrete between 1-1/2 to 2-1/2 inchwhen using machine methods for striking off and consolidating. Increase the slump to 3-1/2 inch if hand finishing is permitted by Landscape Architect

G. Produce ready-mixed concrete in accordance with ASTM C94/C94M, Alternate 2, with a minimum compressive strength of 3500 PSI when cured in a moist room at a temperature within a range of 65 to 75 degrees F for a period of 28 days.

H. Provide Landscape Architect with the mix design for review and approval prior to the actual delivery of the concrete.

PART 3 EXECUTION

3.1 VERIFICATION OF EXCAVATION AND FORMING

A. Prior to the installation of any concrete, examine the excavation and forms for the grades, lines, and levels required to receive the new Work. Ascertain that excavation and compacted subgrades are adequate to receive the concrete to be installed.

B. Correct defects and deficiencies before proceeding with the Work.

3.2 VERIFICATION OF SUBGRADE CONDITIONS

A. Prior to the installing of any concrete, examine the subgrade to ascertain that it is adequate to receive the concrete to be installed. If the subgrade remains wet after all surface water has been removed Landscape Architect may require the installation of edge drain.

3.3 EXISTING IMPROVEMENTS

A. Investigate and verify location of existing improvements, including structures, to which the new Work is to be connected. Make necessary adjustments in line and grade to align the new Work with the existing improvements after approval by Landscape Architect.

3.4 BATCH PLANT

A. Obtain an adequate site for the batch plant at Contractor’s expense. Maintain the site and operate the plant in accordance with the conditions and requirements established by the local community.

3.5 FINE GRADING

A. Fine grade the subgrade to the cross section shown on the Plans and thoroughly compact it prior to placing forms or concrete.

3.6 INSTALLATION - GENERAL

A. Construct the concrete pavement to the width, thickness, and type specified on the Plans or as approved by Landscape Architect.

B. Provide curb drops at street intersections for the construction of sidewalk ramps, conforming to the current rules and regulations of Act 8, Michigan PA 1973.

C. Provide curb drops for sidewalk ramps and driveway approaches at locations specified on the Plans or as approved by Landscape Architect.

D. Restrict construction operations to the existing right-of-way. If additional area is needed, furnish Landscape Architect with written permission from the property owner for any operation conducted outside the established right-of-way.

E. Maintain traffic access at intersections. Ensure vehicle access to commercial and public properties, and other locations as designated by Landscape Architect.

3.7 FORMS

A. Except when paving with a slip-form paver, use forms made of metal with an approved section that provides rigidity under impact, thrust, and the weight of the heaviest machine carried on them. Use metal with a minimum thickness of 1/4 inch, or 3/16 inch if the form has a trapezoidal cross section.

B. Use forms with a minimum length of ten 10 feet and a depth not less than the prescribed edge thickness of the Work. Allow the subgrade to be a maximum of 1 inch lower than the bottom of the forms only when approved by Landscape Architect. Contractor to make sure the base width in direct bearing on the soil is at least 0.75 of the form depth, with a minimum base width of 8 inches.

C. Provide at least three (3) stake pockets for each 10 feet section of form. Keep the forms straight and free from distortion. Contractor to make Ensure no vertical variation exceeds 1/8 inch in 10 feet lengths from the true plane surface on the top of the form when tested with a 10 feet straightedge. Maintain no lateral variation greater than 1/4 inch from the true plane surface on the vertical face of the form when tested with a straightedge.

D. Approved wood or flexible forms and hand finishing will be required on all pavement where the radius for the edge of the pavement is less than 200 feet.

E. Use a connection method between form sections that forms a locked joint. Prevent vertical movement exceeding 1/8 inch and horizontal movement exceeding 1/4 inch under the impact, thrust and weight of the heaviest machine carried on the forms.

F. Provide sufficient forms to avoid removing them in less than 12 hours after placing the concrete, or longer if required.

3.8 EQUIPMENT REQUIREMENTS

A. Use approved mechanical concrete placing and finishing equipment for concrete paving, except in gapped areas or where Landscape Architect approves otherwise.

B. Furnish sufficient equipment for placing concrete pavement. Keep the equipment on the job site and ready for normal operation before starting the paving operation. Maintain equipment in good working order. Subject the equipment to inspections and testing during construction.

C. Use equipment with sufficient capacity to allow the paver to operate continuously, achieve a production rate that ensures good workmanship, and eliminate equipment overloading or frequent interruptions and delays.

D. Equip equipment operating on or near the pavement with rubber-tired wheels.

E. Subgrade Roller or Compactor:

1. Use self-propelled steel-wheeled or pneumatic-tired rollers weighing not less than 8 tons, or self-propelled vibratory compactors of adequate size to compact the subgrade to the required density.

F. Subgrade Planer:

1. A steel-shod subgrade planer supported by two (2) flanged wheels resting on the side forms may be used for trimming the subgrade in small areas when approved by Landscape Architect.
2. Adjust the steel-shod template to fit the shape of the pavement bottom. Connect it adequately to a rigid frame to maintain the crown.
3. Use a planer with sufficient weight to plane off all high spots encountered.

G. Base Trimmer:

1. Use a powered, self-propelled base trimmer for slip-form construction. Contractor to make sure the base trimmer can trim the base to the required cross section.

H. Water Supply Equipment:

1. Use pumps and pipe lines with sufficient capacity and nature to ensure an ample supply and adequate pressure of water simultaneously for machinery, mixing, sprinkling subgrade, and other Work requirements.
2. Water may be supplied in tank wagons to augment inadequate pipe lines or to replace them entirely if a sufficient number of units are employed.

I. Finishing Machine:

1. Use a power-driven finishing machine of an approved type that strikes off and compacts the concrete with screeding and troweling action. Ensure the machine can finish the concrete as specified and provide a minimum of two (2) oscillating screeds.
2. A combination concrete spreader/finishing machine (i.e., Pav-Saver®) may be used for residential streets not exceeding 100 feet in length and 18 feet in width or when approved by Landscape Architect.
    a. The combination type machine must have suitable automatic vibrators, strike-off bars, augers, screeds, finishing pan, etc., in accordance with the requirements of this section, to produce a densely compacted, homogeneous concrete slab, true to line, grade and cross section.

J. Concrete Spreader:

1. Use an approved concrete spreader with a strike-off board or a separate strike-off to level each layer of concrete before placing reinforcement and before finishing the concrete.
    a. Ensure the equipment has sufficient weight and rigidity to retain its shape under working conditions and properly strike off the concrete.
    b. Two separate spreaders are not required where an approved mesh depressor type machine is used.
2. A concrete spreader is not required for the construction of residential street concrete pavement when approved by Landscape Architect.

K. Vibratory Screed:

1. Provide an approved hand-propelled vibratory screed for use in gapped areas at driveways and intersections, and where machine methods cannot feasibly screed and consolidate the concrete.
    a. Limit gaps finished by this method to one (1) joint spacing in length and one (1) single lane width.
2. Construct the screed with a steel-shod strike board at least two 2 inches thick, equipped with a gasoline engine capable of producing at least 5,000 vibrations per minute.
3. Other vibratory screeds may be approved by Landscape Architect.

L. Membrane Sprayer:
1. A mechanically-pumped pressure sprayer capable of applying a continuous uniform film of curing compound will be required.
2. Ensure the equipment provides adequate stirring of the compound during application.

M. Slip-Form Paving Equipment:
1. When pavement is placed by the slip-form method, operate slip-form paving equipment to spread, consolidate, screed, and mechanically float freshly-placed concrete, minimizing hand finishing needed to produce a dense and homogeneous pavement.
2. Equip the machine to vibrate the concrete across the full width and depth of the pavement being placed.

N. Floats:
1. Use a combination float finisher as the mechanical float. Omit a separate mechanical float when a mechanical float forms an integral part of a slip-form paver.
2. Construct a float finisher as a machine with two (2) screeds and equip it with a suspended pan float. Suspend the second screed and pan float so they operate independently of the side forms.
3. A mechanical float will not be required for the construction of residential street concrete pavement.

O. Footbridge:
1. Provide a movable bridge when necessary to finish the pavement or construct joints satisfactorily. Design and construct the bridge to avoid contact with the concrete.

P. Transverse Float:
1. Make this float of metal, at least 10 feet in length, and of the box or channel type with a floating face at least 6 inches wide. Construct it to be light in weight, rigid, and free from warps.

Q. Vibrator:

1. Use an approved internal electric or mechanical vibrator, at least 2 inches in diameter, to consolidate concrete along the faces of the forms and adjacent to joints. Maintain a minimum frequency of 5,000 vibrations per minute for a tube 2 inches in diameter, 3,600 vibrations per minute for a tube 4 inches in diameter, or a proportionate frequency for an intermediate size.
2. Provide at least two (2) vibrators for each concrete paving unit on the project.
3. Connect vibrators used adjacent to the forms in conventional paving to the equipment on which they are mounted. Start concrete vibration automatically with the equipment's forward movement and stop it automatically whenever forward movement ceases.

R. Form Tamper:

1. Use a mechanical form tamper of approved design on all projects. Ensure it thoroughly and uniformly compacts the soil under the forms.

S. Strike-Off for Reinforcement:

1. Use an approved strike-off to level the concrete before placing pavement reinforcement. Adjust it and support it with two (2) flanged wheels on each end resting on the side forms.
2. Ensure it has sufficient weight and rigidity to retain its shape under working conditions and properly strike off the concrete.
3. Use an approved hand strike-off resting on the forms for irregular areas.
4. The strike-off may be a part of the concrete spreader or a finishing machine.

T. Lane Tie Bar Installer:

1. Install lane tie bars with an approved mechanical device when not placed on approved chairs.

U. Reinforcement Carrier:

1. Transfer reinforcement not placed on chairs from hauling equipment to a movable bridge spanning the pavement being cast or place it by other approved means that avoid contaminating the concrete.
2. Design the bridge to carry the reinforcement load without appreciably deflecting the forms.

V. Joint Filling and Sealing Equipment:

1. Make equipment for filling and sealing joints available for inspection and testing at least 48 hours before use.
2. Include a mechanical mixer in the sealing machine to mix sealing components into a uniform, homogeneous mass.
3. Use a heating kettle for hot poured sealing material of the indirect-heating or double boiler type, employing oil as the heat transfer medium.

a. Equip the heating kettle with a thermostatically controlled heat source, a built-in automatic agitator, and thermometers indicating the temperatures of both the melted sealing material and the oil bath.

b. Demonstrate that the proposed equipment consistently produces a joint sealer of proper pouring consistency.

4. Apply the hot-poured sealing material directly from the heating kettle. Equip the kettle with a pressure pump, hose, and nozzle suitable for forcing sealing material to the bottom of the joint and completely filling the joint.

a. Control the application rate to completely fill the joint without spilling material on the pavement surface.

b. Maintain the temperature of sealing materials in the hose and nozzle, ensuring temperature loss does not exceed 10 degrees F between the nozzle and the heating tank.

c. Do not use direct flame heat on the nozzle to maintain the proper temperature of the sealing material.

d. Mount the heating equipment on rubber-tired wheels. Use only rubber-tired equipment to move the heating equipment on the pavement.

5. Apply cold applied sealing compound using pressure equipment that forces the material to the bottom of the joint and completely fills the joint without overflowing onto the pavement surface.

W. Preformed Neoprene Joint Sealing Equipment:

1. Equipment for applying the lubricant and installing the preformed joint seal may be either power or hand operated equipment suitable for installing the joint seal as recommended by the manufacturer.

X. Sandblasting Equipment or Power Wire Brush:

1. Use sandblasting equipment of proper size and capacity to achieve the specified cleaning. Operate it at a nozzle pressure adequate for the performance of the Work.

2. Use nozzles with a diameter appropriate for the width of the joint. Replace them as necessary when enlarged by wear.

3. A power wire brush may be used in place of sandblasting equipment.

Y. Air Compressors:

1. Use portable air compressors capable of supplying sufficient air to maintain nozzle pressure adequate to remove all loose concrete fragments and foreign material from the joints.

2. Employ suitable traps to keep the compressed air free of oil and moisture.

Z. Power Broom:

1. A mechanical broom with pickup suitable for cleaning the pavement will be required.

AA. Concrete Saw:

1. Provide two (2) self-propelled concrete saws adequately powered to cut hardened concrete to the minimum depth shown on the Plans. Use saw blades with a minimum thickness of 3/16 inch.
2. Equip saws with suitable guards.

BB. Miscellaneous Equipment:

1. Provide all other small tools necessary to completely and satisfactorily finish the Work, including straightedges for testing pavement and forms.

3.9 PLACEMENT OF FORMS

A. Place and check forms for line and grade at least 500 feet in advance of placing concrete.

B. Stake and brace forms adequately to resist the pressure of concrete and the thrust of the equipment.

C. Ensure forms have uniform bearing on the subgrade throughout their entire length and width.

D. After setting the forms to grade, thoroughly tamp both the inside and outside with an approved mechanical form tamper.

E. Thoroughly clean forms before placing them.

F. Join forms neatly and tightly. Secure them with at least three (3) stakes per form.

G. Oil forms before placing concrete against them.

H. Check forms for line and grade after setting them.

I. Adjust forms showing a variance from the staked line exceeding 1/4 inch or from the staked grade exceeding 1/8 inch in 10 feet.

J. Provide sufficient back bracing when using flexible forms to prevent undue deflection during concrete placement.

3.10 PLACING CONCRETE

A. Placing of concrete should not commence or continue until the condition of the subgrade has been approved by Landscape Architect.

B. Spread or distribute concrete immediately after placing. If not using a mechanical spreader, deposit concrete to minimize re-handling and avoid segregation and separation of materials. Deposit concrete to a height sufficiently above grade so that consolidation and finishing achieve the required finished grades.

C. Consolidate and compact concrete along the faces of forms and adjacent to joints to fill all voids.

D. Do not vibrate forms to consolidate the concrete.

E. When the pavement is placed in two (2) layers, the first layer may be cast 3 to 6 inches narrower on each side than the proposed pavement slab, so that the full depth of pavement, at the edges, will be cast with the second layer.

F. Vibrate concrete placed full depth across the complete width and depth of the pavement being placed. Vibrate only the second layer for concrete placed in two (2) layers.

G. Place concrete continuously as much as possible between transverse joints.

H. Cover concrete and the unfinished slab end with wet burlap or plastic whenever a temporary halt in operation occurs.

I. Place a construction joint if the Work interruption continues more than 20 minutes, provided the proposed joint is 15 feet or more from the last joint for reinforced pavement and at least 10 feet or more from the last joint in plain concrete pavement.

   1. Do not permit sections of pavement shorter in length; remove and replace any constructed sections at Contractor's expense.

J. Construct integral curbs monolithic with the pavement slab where specified or required. Place the curb material before the pavement begins its initial set, using the same mix as the concrete pavement.

K. Use base and back forms when constructing straight curbs. Use back forms with templates of the required curb shape when constructing rolled and mountable curbs. Spade curb concrete sufficiently to eliminate all voids and tamp to bring mortar to the surface. Give the curb a final finish to match the pavement texture.

L. Fill any visible honeycomb or minor defects immediately after removing forms with mortar made of one part Portland cement and two parts fine aggregate. Apply the mortar with a wooden float.

M. Do not operate equipment on recently placed concrete in adjacent pavement lanes constructed in separate pours until the pavement attains at least 85% of design strength from testing cores or reaches 14 days old, as determined by Landscape Architect.

N. Operate any equipment wheels on the pavement at least 1 foot from the pavement edge. Use rubber-tired equipment wheels.

O. Do not permit the paver on the new slab until the pavement attains full design strength. Prevent the paver from operating on any new slab without using wood mats of approved thickness and width to avoid marking or structural damage.

P. Pavers are not permitted to operate on residential streets.

Q. Repair damaged curing compound by spraying additional curing compound on damaged areas as soon as the Work is completed.

R. Pour the filler strip on pavement widening projects as soon as possible, but no later than the first working day after placing the slab.

S. Complete construction at all intersections and where property access is required by gapping the proposed pavement. Place load transfer, contraction, or end-of-pour joint devices at the gapped pavement ends.

T. In lieu of pavement gapping, Contractor may elect to place a temporary bridge, of a design approved by Landscape Architect, to provide access. Furnish, place, maintain, and remove the bridge at Contractor's expense.

3.11 PLACING PAVEMENT REINFORCING

A. Place reinforcement sheets or mats at the depth below the finished pavement surface shown on the Plans.

B. Ship and deliver pavement reinforcement to the Work in flat sheets or mats.

C. Lap adjacent sheets or mats as indicated on the Plans, fastening them to each other in no fewer than two (2) places in each pavement lane.

D. Maintain reinforcement requirements as called for on the Plans where pavement width varies. Use split sheets or mats to conform to the specific pavement configuration. Ensure side laps are not less than the spacing of longitudinal wires or bars.

E. Substitute 1/2 inch diameter longitudinal reinforcing bars for standard reinforcement on widening Projects where the pavement slab is less than 6 feet wide. Space bars no more than 12 inches center-to-center. Place the first bar no more than 3 inches from the edges of the widened slab and lap bars a minimum of 12 inches.

F. Install reinforcement using one of the following methods:

1. Use chairs that support the reinforcement and provide sufficient bearing on the base to prevent undue penetration. Space chairs to maintain reinforcement at the specified depth. Place reinforcement directly from the hauling unit onto the chairs.

2. Mechanically spread and strike off the first concrete layer to the required depth below the proposed finished surface when placing reinforcement between two (2) layers of concrete. Place reinforcement directly from the carrier onto the struck-off concrete.

3. Mount reinforcement on chairs in any area where using the mechanical spreader or mechanical strike-off is not feasible.

3.12 JOINTS

A. Construct all longitudinal and transverse joints to conform to the details and at locations shown on the Plans or as directed by Landscape Architect.

B. Construct all joints true to line with faces perpendicular to the pavement surface.

C. Construct transverse joints at right angles to the pavement centerline, unless otherwise specified on the Plans or determined by Landscape Architect. Limit joint variation to no more than 1/4 inch from a true line.

D. Finish the pavement surface adjacent to all joints to a true surface. Edge joints to the radius shown on the Plans or a minimum 1/4 inch radius where indicated. Test the surface across joints with a 10 foot straightedge as joints are finished, and correct any irregularities before the concrete hardens.

E. Place transverse joints in succeeding partial-width slabs in line with the corresponding joints of the first slab. For widening existing pavements, place transverse joints as shown on the Plans or as directed by Landscape Architect.

F. Form keyways accurately using templates of metal, wood, or paper securely pinned in place. Ensure the gauge or thickness of template material forms the full keyway as specified and in the correct location.

G. Longitudinal Joints:

1. Construct longitudinal joints as longitudinal lane tie joints with tie bars or bulkhead construction joints with hook bolts. Build a keyway in the bulkhead construction joint where called for on the Plans.

a. Longitudinal Lane Tie Joint (D):

1) Form longitudinal lane tie joints with tie bars as planes of weakness by sawing a groove in hardened concrete according to the alignment, width, and depth shown on the Plans.

2) Place tie bars of the specified type, diameter, and length at the required depth parallel to the finished surface, at right angles to the joint, and at the uniform spacing called for on the Plans or as approved by Landscape Architect.

3) Use bar chairs to support the lane tie bars or install the lane tie bars with a mechanical device approved by Landscape Architect. Do not place lane tie bars in the concrete by hand methods.

4) Saw the joint as soon as the concrete will not spall or within three (3) days after placement, and complete the sawing before any traffic uses the pavement. Immediately after sawing the joint, remove the slurry completely from the joint and surrounding area by flushing with a jet of water under pressure.

5) Blow out the joint with a jet of compressed air to remove the flushing water.

a) After the joint dries, clean it out with a jet of compressed air at a working pressure of at least 90 psi, then seal it in accordance with these specifications using an approved hot or cold applied type joint sealing compound.

b) Apply the sealing compound with approved pressure type equipment, extending the nozzle into the groove, and fill the groove until the sealer overlaps the pavement about 1/8 inch.

b. Longitudinal Bulkhead Construction Joint (D):

1) Use longitudinal bulkhead construction joints with hook bolts in part-width concrete pavement construction and other locations shown on the Plans or as approved by Landscape Architect. Follow the size, spacing, and depth of the hook bolts below the pavement surface as shown on the Plans.

2) Substitute lane ties of an approved type for hook bolts in slip-form paving and space them at 30 inch centers, unless otherwise indicated on the Plans.

a) Place lane ties for slip-form paving in the concrete using a pneumatic powered installer or equipment producing equal results.

b) Replace lane ties that are not set with adequate concrete consolidation or are not within 30 degrees of perpendicular to the pavement edge in a horizontal plane with drilled-in expansion-anchored lane ties.

3) Attach hook bolts and couplings to the forms when constructing a bulkhead joint and hold them in position during concrete placing and finishing to allow removal of the pavement forms without damaging the concrete or hook bolt assembly. Protect the ends of the couplings to prevent concrete, dirt, or other materials from entering and obstructing a satisfactory connection with either hook bolt.

4) Insert rust preventive oil into the open end of the couplings immediately after removing the pavement forms where hook bolts or lane ties are installed for future pavement widening, curb, or curb and gutter construction, using a hand-operated pump to apply enough oil to completely cover the internal threads.

a) After applying the protective oil, insert neoprene or plastic plugs into the ends of the couplings to completely seal the opening without protruding more than 3/8 inch outside the couplings.

5) Edge the concrete with a tool matching the radius of curvature and depth of lip shown on the Plans. Use a longer lipped edging tool for the second concrete pour than the one used for the first pour.

6) After the concrete cures for the required time, remove all extraneous material from the joint and then seal the joint with an approved hot-poured or cold-applied elastic-type compound. Clean the joint before sealing using sandblasters and a jet of compressed air.

H. Transverse Joints:

1. Design transverse joints as contraction joints, plane of weakness joints, dummy joints, expansion joints, construction joints, end-of-pour joints, and pressure relief joints.

a. Contraction Joints (C):

1) Construct contraction joints with a load transfer unit and a joint groove formed by sawing. Build contraction joints as indicated on the Plans and space them at a maximum of every 57' - 3" or as otherwise provided.

2) Use epoxy-coated dowel bars as the load transfer unit, spacing and arranging them according to the positions indicated on the Plans. Hold them accurately in place with an approved metal device to keep them perpendicular to the pavement cross-section plane and parallel to the centerline, at a depth from the surface equal to 1/2 the slab thickness.

3) Use a device consisting of connected transverse and longitudinal members arranged to hold each dowel firmly so that its final position after concreting does not vary more than 1/8 inch per foot of length from the designated line and grade. Design the device to allow complete assembly of the joint

alongside the Work and to be sufficiently rigid to lift the joint into place on the subgrade as a unit.

4) Allow one end of each dowel bar to move freely in the slab as the concrete contracts and expands.

a) Lubricate 2/3 of each dowel's length thoroughly with liquid asphalt to allow movement. Apply the liquid asphalt coating to a sawed end of the dowel bar or, for dowel bars with sheared ends, place a metal cap on the coated end.

b) Allow the asphalt coating to dry sufficiently before using the dowels to prevent removal during handling and placement in the joint.

c) Install the bars so that the coated end alternates on each side of the joint.

b. Plane of Weakness Joints (WT):

1) Place Plane of Weakness joints only in plain concrete pavements immediately after finishing operations. Form a groove in the plastic concrete with a metal forming bar to the depth indicated on the Plans.

2) Place a premolded bituminous filler strip in the groove formed by the metal bar using a bridge operating on the pavement forms.

3) Float the concrete against the sides of the filler, then edge the joint to a 1/8 inch radius.

c. Plane of Weakness Joint for Concrete Base Course (WTB):

1) Place dummy joints in reinforced concrete pavements only where called for on the Plans.

2) Construct dummy joints immediately after finishing operations by forming a groove in the plastic concrete with a metal forming strip and placing expanded polystyrene or another approved temporary filler into the groove.

3) Install the material flush with the pavement surface and finish the area on both sides of the joint. Do not edge transverse joints with a temporary filler.

4) Continue the pavement reinforcement through this joint.

d. Expansion Joints (E) and (E1):

1) Construct expansion joints (E1) with a load transfer unit and a premolded fiber filler and use them on reinforced concrete pavements or where shown on the Plans.

2) Construct expansion joints (E) with a premolded fiber filler without the load transfer unit and use them for joints in concrete capping, end connections with structures or existing pavements, plain concrete pavements, and other locations shown on the Plans or where installing the load transfer unit is not feasible, as approved by Landscape Architect.

3) Assemble the load transfer units and lubricate the epoxy-coated bars with liquid asphalt. Provide a close-fitting metal cap on the liquid-asphalt-coated end of each bar.

4) Extend the fiber filler the full depth and width of the joint.

   a) After installation, position the top at no less than 1/2 inch and no more than 1 inch below the finished surface.

   b) Furnish the units in lengths not less than the lane widths being poured. Provide additional partial lengths with a minimum length of load transfer unit and premolded fiber filler sufficient to span two (2) dowel bar spacings.

   c) Securely join sections together when more than one (1) section is allowed and used in a joint.

5) Extend the fiber filler used in the pavement completely through the curb section for expansion joints in curb lanes with integral curb or separate curb and gutter. Place the fiber filler above the slab in the curb at 1 inch in width.

6) Hold the joint in place during installation with an approved installing device securely staked.

   a) Protect the top edge of the filler during concrete placement with a metal channel cap of at least 10-gage material, having flanges not less than 1-1/2 inches in depth.

   b) Shape the channel cap to the proposed crown of the pavement and extend it over the full length of the filler.

e. Pressure Relief Joints (PR):

1) Construct the pressure relief joint using the method indicated on the Plans.

2) Use a flexible, low-density, expanded, extruded polyethylene plank as the pressure relief joint material. Cut the joint material off to 1/2 inch below the top of the pavement surface, and extend it entirely through and to within 1/2 inch of the face and top of the curb.

f. End of Pour Joints and Construction Joints:

1) Form end of pour joints in reinforced pavement by placing a bulkhead and installing a load transfer device, as specified for contraction joints, except do not lubricate the ends of the dowel bars. Install the load transfer device so that each dowel bar is embedded in the concrete for 1/2 of its length.

2) Provide a space for hot-poured rubber joint filler during the next pour by placing a temporary filler in the fresh concrete.

3) Construct end-of-pour joints using 2-piece dowels and a bulkhead, and place them where a delay of three (3) days or more is anticipated between the casting of adjacent pours.

4) Seal construction joints and end-of-pour joints as specified for transverse contraction joints.

5) Form end-of-pour joints in plain concrete pavements by placing a bulkhead, fiber keyway, and installing 1/2 inch diameter deformed bars, 30 inches in length, at 18 inch intervals across the end of the pavement.

6) Thicken the pavement across the end of both slabs, and edge and seal the joint.

2. Extend all transverse joints in concrete pavement entirely through the integral curb or separate curb and gutter. Use the same kind of material to construct the joint in the curb as provided for the pavement.

3. Use bituminous fiber filler to construct expansion joints in the integral curb of reinforced concrete pavements.

   a. Set the thickness of the fiber filler material in the curb above the gutter to 1 inch.

   b. Precut the joint material to conform to the geometric shape and cross-sectional area of the curb, and place it in intimate contact with the filler material in the pavement.

I. Round the edges of all transverse joints in the integral curb with an approved finishing tool, having a radius of 1/4 inch.

3.13 CONSOLIDATING AND FINISHING

A. Follow this sequence of operations after placing the concrete:

1. Striking off and consolidating

2. Floating

3. Edging

4. Final finishing with burlap drag

B. Employ mechanical methods to strike off and consolidate or compact the concrete, except in gapped areas or where the pavement width prevents machine methods. Finish gaps less than one (joint opening in length by hand methods, ensuring they are finished in single-lane widths.

C. Strike off, consolidate and compact the concrete to such an elevation that when all finishing operations are completed, the surface will conform to the required finished grade and cross section.

1. Maintain at least 4 inches of concrete above the finished pavement grade ahead of the screed for its entire length.

2. Operate a single screed finishing machine twice over each section of the pavement when consolidating the surface on residential street construction.

3. Work only sufficient mortar to the surface to provide a dense, smooth finish.

4. Do not operate the machine excessively over a given area. Thoroughly mix segregated particles of coarse aggregate collected in front of the screed by hand with the mass of concrete already on the subgrade.

D. Use an approved, self-propelled vibratory screed to strike off and properly consolidate the concrete surface to the required finish grade when mechanical equipment cannot be used on irregular areas.

   1. Consolidate the entire area of the pavement to ensure an absence of voids.

   2. Where it is not possible to use a vibratory screed, a hand strike board of an approved design, will be permitted.

      a. Move strike-off boards forward with a combined longitudinal and transverse motion, keeping both ends in contact with the side forms during the process.

      b. Keep a slight amount of excess concrete in front of the front edge at all times.

      c. When striking off and consolidating by hand, pours will be limited to single lanes or 1/4 of intersections.

E. Make the surface uniform by longitudinal or transverse floating using a mechanical method after striking off and consolidating, unless constructing the pavement in single lane widths is permitted.

F. Where mechanical floating is an integral part of the operation of a slip-form paver, separate mechanical floating methods will not be required.

G. Mechanical longitudinal floating will not be required for residential street construction.

H. Operate a transverse float at least 10 feet in length across the pavement by starting at the edge, slowly moving to the center, and back to the edge when mechanical equipment is not used for floating. Then move the float ahead 1/2 of its length and repeat the operation.

I. Preserve the crown and cross section of the pavement carefully.

J. Do not proceed with the float finishing operation until the concrete attains a consistency that prevents excess concrete from being carried ahead of the float, yet allows the entire surface to be floated and sealed.

K. Immediately after float finishes and while the concrete remains plastic, test the slab surface for trueness using a 10 foot straightedge or acceptable float.

   1. Place the straightedge at the center of the slab with the blade parallel to the centerline, and pull it slowly and uniformly to the edge. Repeat this operation until the concrete surface is free from irregularities and makes contact at all points with the bottom of the straightedge. Then move the straightedge forward half its length and repeat the operations.

   2. Fill depressions found in the surface with fresh concrete and consolidate them by floating with a long-handled float not less than 10 foot in length. Use this float also to smooth sections of the surface that have become rough or torn by dragging with the straightedge.

L. Determine edge settlement for pavement constructed by the slip-form method as soon as practical after paving operations begin. Correct edge settlement exceeding 3/8 inch before the concrete hardens.

1. Suspend paving and make operational corrections when edge settlements exceed 1/4 inch before Landscape Architect permits resumption of paving. Discontinue slip-form methods and place pavement using conventional forms if Contractor consistently fails to construct pavement within these tolerances.
2. Wipe all mortar paste from the sides of the slab when paving is accomplished by the slip-form paving method.
3. Test the surface for smoothness with the straightedge. Ensure uniform contact of the straightedge with the concrete over the entire length tested. Perform testing when the surface is free from soft mortar or excessive water. Use the testing straightedge exclusively for this purpose.

M. Work all laitance, surplus water, and inert material entirely off the pavement as soon as hand floating is completed when the float finisher method is not utilized. Smooth the surface by dragging with a rigid 10 foot straightedge and test the surface.

N. Finish the pavement by dragging a seamless strip of damp burlap or cotton fabric, not less than 5 feet nor more than 6 feet in width, over the full width of the pavement as soon as all excessive moisture disappears and while it remains possible to produce a uniform surface of gritty texture.

1. Pull the burlap or cotton drag by a bridge supported on pavement forms. Renew the fabric as often as necessary to obtain the required texture.

O. Finish the edges of the slab and all specified joints immediately after the initial finishing with burlap using an edging tool to the radii indicated on the Plans. Then give the pavement a final finish by dragging damp burlap or cotton fabric over the portion of the pavement disturbed by the edging operation.

3.14 SURFACE REQUIREMENTS

A. Remove or reduce high spots in the surface exceeding 1/8 inch from the straightedge but not more than 1/2 inch in 10 feet by rubbing with a carborundum brick and water until contact with coarse aggregate is made. Remove high spots that contact coarse aggregate before reaching acceptable tolerance using an approved surface-grinding machine before accepting the pavement.

B. Have Landscape Architect evaluate high spots exceeding 1/2 inch in 10 feet. Remove and replace the work at Contractor's expense if it is rejected.

C. Take immediate steps to eliminate the cause of the defective surface.

3.15 CURING

A. Completely coat and seal the surface of the slab with a uniform layer of white membrane curing compound after finishing operations are completed and immediately after the free water has left the surface.

B. Apply the compound in a continuous uniform film using mechanically pumped pressure sprayer equipment at a rate of 1 gallon per 200 sft of surface. Do not thin the curing compound.

C. Provide equipment with adequate stirring of the compound during application. Contractor to make sure the equipment for applying the compound is on the Project and approved by Landscape Architect before starting Work.

D. Hand-spray equipment will be permitted only for the application of the curing compound over the sides of the slab, and for any minor damaged areas.

E. If rain falls on the newly coated pavement before the film has dried sufficiently to resist damage, or if the film is damaged in any other way, Contractor will be required to apply a new coat of material to the affected areas.

F. Protect the treated surface from injury for at least seven (7) days. Consider all traffic, including foot traffic, injurious to the film of the applied compound. Permit only minimal foot traffic on the dried film as necessary to properly carry on the work, including removal of high spots. Immediately repair any damage to the film by applying a second coat of the compound.

G. Coat the entire area of the side of the slab with the curing compound immediately after removing the forms, applying it at the rate specified for the pavement surfacing.

H. Provide sufficient burlap or polyethylene coverings on the Project to protect the pavement in case of rain or spray equipment breakdown. Consider failure to provide proper curing as sufficient cause for immediate suspension of concreting operations.

3.16 REMOVAL OF FORMS

A. Remove forms from freshly placed concrete after it has set for 12 hours, provided no damage occurs to the pavement or curb edge. Cease form removal if damage occurs during the process, and wait until the concrete has attained greater strength before resuming.

1. The period of time for removing forms may be increased or decreased when approved by Landscape Architect.

B. Clean the ends of all joints immediately after form removal. Fill any visible areas of honeycomb or minor defects with mortar composed of one part Portland cement and two (2) parts fine aggregate from the same source as used in the pavement, applying it with a wooden float.

1. Take immediate steps to correct the conditions contributing to these defects.

C. Spray the sides of the pavement with curing compound immediately upon form removal, except where honeycombed areas require pointing, then cure those areas immediately.

D. Do not place forms and pins on new pavement being cured with membrane.

3.17 SAWING JOINTS

A. Saw contraction joints, longitudinal lane-tie joints with tie bars, and end of pour joints.

B. Saw joints before permitting any traffic on the pavement.

1. The concrete saw will be permitted on the pavement to saw the joints, but the water supply truck will not be permitted on the pavement until the compressive strength is not less than 3,000 psi.

2. When permitted on the pavement, the water supply truck must be kept a minimum of 50 feet behind the sawing operation.

C. Make at least two (2) approved concrete saws available for use at all times, ensuring one saw can cut a joint groove 2-1/2 inch deep.

D. Cut the saw groove for transverse end-of-pour joints to receive the joint sealing material.

E. Saw longitudinal lane-tie joints with tie bars according to the alignment and dimensions indicated on the Plans.

F. Saw the joint groove for joints formed in one operation before any transverse cracks develop. Repair raveling or spalling along the joint as specified elsewhere in this Section.

G. Saw transverse contraction joints in two stages:

1. Stage 1 Sawing:

a. Make the first stage a relief cut directly over the center of the load transfer assembly. Perform the initial relief cut as soon as the saw can be placed on the freshly poured concrete, and continue sawing as long as the pavement can support the saw without creating or appreciably raveling the joint.

b. Apply membrane curing compound immediately when water is not used in the sawing operation.

c. Completely remove the slurry resulting from sawing when water is used by flushing the cut and immediate area with a jet of water. Apply additional membrane curing compound within 12 hours after making the relief cut.

2. Stage 2 Sawing:

a. Start the second stage of joint sawing only after the concrete has cured for a minimum of 48 hours. Center the joint groove over the relief cut and saw it to the specified dimensions shown on the Plans, including any increase in width of the relief cut due to shrinkage or contraction. Maintain a groove width tolerance of ± 1/16 inch.

b. Blow joints sawed without water clean of all foreign material using a jet of compressed air.

c. Completely remove the slurry resulting from the sawing operation when water was used by flushing the groove and immediate area with a jet of water, then blow dry with compressed air.

H. Perform a final cleaning of transverse joint grooves with a jet of compressed air adequate to remove all foreign material just before permanent sealing.

I. Temporarily seal the joint groove with a suitable material or device to prevent infiltration of foreign material if the specified seal is not installed within seven days of final sawing.

J. Do not permit traffic over the full width joint grooves before installing the permanent or temporary seal.

3.18 PATCHING JOINTS

A. General:

1. Inspect joints for spalls and voids after sawing and cleaning.
2. Remove loose, unsound, or damaged concrete to the satisfaction of Landscape Architect.
3. Classify spalls and voids as minor, intermediate, or major, and repair accordingly.

B. Minor Spalls:

1. Repair spalls or voids that increase the specified size of the joint groove beyond any limits, but less than 36 square inches, by patching with an approved epoxy mortar before installing the seal.
    a. Spalls which extend more than 1/4 inch from the joint face and over 1/2 inch below the surface of the pavement.
    b. Spalls which extend more than 1/4 inch from the joint face and 2 inches or more in length, regardless of the depth of spall below the surface of the pavement.
    c. Void areas larger than 1/2 inch in diameter in the upper 1 inch of the joint face or larger than 1 inch in diameter regardless of location.
2. Thoroughly clean the spalled concrete surface by sandblasting, power-wire brushing, or hand-wire brushing. Then blow the patch area clean with a jet of compressed air.
3. Insert a heavy polyethylene sheet or rigid material into the joint groove and hold it tightly against the joint face to be patched.
4. Ensure concrete is clean and dry when placing epoxy resin mortar. Remove frost by heating with a clean heat source approved by Landscape Architect until dry. Take care not to damage the concrete during heating.
5. Epoxy binder will be a mixture of two (2) parts epoxy resin to one (1) part curing agent by volume, or as approved by Landscape Architect.
6. Mix epoxy resin compound in a clean metal or polyethylene container using an approved stirrer operating at 250 to 500 rpm. Gradually add the curing agent compound while mixing. Stir the mixture for a minimum of three (3) minutes until uniform.
7. Reserve a small portion of the thoroughly mixed epoxy binder for priming.
    a. Uniformly blend dry MDOT 2NS sand into the remaining mixture to create an epoxy mortar of stiff or trowelable consistency. Use one part of mixed binder to about 3.5 parts of dry sand by volume to achieve a workable mix.
8. Prime the spalled surface with freshly mixed epoxy binder by scrubbing it into the surface using a suitable applicator. Ensure complete wetting and coverage of all areas where the epoxy mortar must bond.
9. Place the epoxy mortar in the spalled area immediately after priming and finish it to match the shape of the original pavement surface. Apply a second coat if the bond

coat is not tacky when placing the mortar. Ensure the patch edge conforms with the rest of the joint groove.

10. Sprinkle dry MDOT 2NS sand onto the fresh epoxy mortar surface to eliminate gloss. Carefully remove the polyethylene insert after the epoxy mortar has cured sufficiently to resist damage during sealing operations.
11. Clean joints finally with a jet of compressed air to remove foreign material.
12. Place the hot-poured elastic type joint seal the day following epoxy resin mortar patch placement when air and pavement temperatures exceed 50 degrees F. Determine curing time for epoxy mortar by Landscape Architect when air and concrete temperatures fall below 50 degrees F.

C. Intermediate Spalls:

1. Repair spalls larger than 36 square inches, but not extending below the reinforcing mat, by sawing and chiseling out unsound concrete and patching with Portland cement mortar.
2. Make a saw cut at least 1 inch deep parallel to the joint groove at the outer extremity of the spalled area. Chip out concrete to the saw cut to create a vertical face at the back of the repair area, and trim the two ends of the repair area to approximately vertical faces.
3. Sandblast the repair area to remove all loose particles, then blow it clean with a jet of compressed air to remove sand and other foreign materials.
4. Flush the repair area with clean water and blow out excess water with compressed air.
5. Insert a heavy polyethylene sheet or rigid material into the joint groove and hold it tightly against the joint face to be patched.
6. Prime the bottom and vertical faces of the repair area with a grout of creamy consistency made from a 1:1 mixture of Portland cement and MDOT 2NS sand with water.
7. The prime coat will be scrubbed into the surface with a suitable applicator to insure complete wetting and coverage of all areas to which the Portland cement mortar must bond.
8. Carefully apply cement grout to the rough surfaces of the spall area immediately before placing fresh mortar, ensuring the prime coat remains wet when covered by mortar.
9. Tamp Portland cement patching material into the repair area and finish it level with the pavement surface.
    a. Mix Portland cement mortar using 1 part Portland cement to two (2) parts MDOT 2NS sand with a water content not exceeding 4 gallons per sack of cement.
    b. Add a liquid air-entraining agent to maintain an air content of 8% to 11%.

c. Calcium chloride in an amount of one (1) percent of the cement content may be added as an accelerator, if approved by Landscape Architect.

10. Match the edge of the patch at the joint face with the rest of the joint groove.

11. Spray white membrane curing compound on the patch surface immediately after casting and finishing the mortar.

12. After 72 hours, carefully remove the polyethylene form and clean all patched joints with a jet of compressed air to remove all foreign material.

D. Major Spalls:

1. Consider a joint damaged beneath the depth of the reinforcing mat as a major repair. Handle these major repairs individually under the direction of Landscape Architect.

3.19 SEALING JOINTS

A. Fill and seal transverse expansion, contraction, construction, and longitudinal bulkhead construction joints with an approved hot-poured elastic type compound.

B. Pressure fill and seal longitudinal lane-tie joints with either an approved hot-poured or cold-applied elastic type compound. Do not place these sealing compounds when atmospheric or pavement temperatures fall below 50 degrees F or during rainy or foggy weather.

C. After completing the shoulders and curing the pavement, clean the joints and pavement surfaces on each side of the joints of all extraneous matter.

1. Perform the cleaning by sandblasting or other methods approved by Landscape Architect that effectively clean the concrete.

2. Remove dust and sand present after sandblasting or cleaning with a jet of compressed air. Use hand tools to remove stones and other foreign materials from the joint groove.

D. Immediately after cleaning the joints with compressed air and drying the concrete surface in the joint, seal the joint with an approved hot-poured elastic type compound.

E. Melt the hot-poured compound in an approved double boiler type kettle. Do not use direct heating. Avoid using any sealing material heated beyond the safe heating temperature in the Work.

F. During the process of pouring the joints, Landscape Architect may, at his discretion, require that sufficient compound be taken from the melting unit to make flow tests.

G. Landscape Architect may require Contractor to modify Contractor's method of heating or of charging the heating unit with compound that will produce satisfactory results.

H. Pour from the melting kettle equipped with an approved pressure pump hose and nozzle.

I. When authorized by the Landscape Architect, the sealing compound may be poured with a hand-type pouring pot for curbs and short miscellaneous joint lengths, provided a satisfactory joint is obtained.

J. Pour the sealing compound to fill the joint to 1/4 inch below the top of the pavement. Immediately remove any sealing compound spilled on the pavement surface.

K. After the first pour cools to pavement temperature and settles, make a second pour to bring the sealing compound to 1/4 inch below the pavement surface.

L. Do not permit traffic over the poured joint until the compound hardens sufficiently to resist pickup.

M. Cover the sealed joint with a 1-1/2 inches wide strip of paper or other approved means immediately after applying the compound to protect hot-poured and cold-applied sealing compound during curing and prevent pickup by traffic. Leave the paper strip in place until worn off by traffic.

3.20 TRAFFIC CONTROL

A. Provide measures necessary to protect and maintain traffic and to protect the Work in accordance with Section 01 50 00 - Temporary Facilities and Controls and with the Michigan Manual of Uniform Traffic Control Devices (M.M.U.T.C.D.).

3.21 PROTECTION AGAINST RAIN

A. Adequately protect the new concrete from rain effects before it hardens sufficiently.

B. Keep enough burlap or 6 mil polyethylene film available on the job site at all times to cover and protect one day's Work.

C. Stop all operations and begin covering when rain appears imminent.

D. Uncover the concrete as soon as the rain ceases and drag the surface burlap where necessary.

E. Apply curing compound to any areas where it has been disturbed or washed away. Protect the new concrete against rain at Contractor's expense.

3.22 COLD WEATHER PROTECTION

A. Keep a sufficient amount of clean, dry straw or hay, polyethylene film, or other approved materials on-site to cover at least one day's production whenever freezing temperatures threaten. Provide cold weather protection at Contractor's expense. Use temperature forecasts prepared by the local weather bureau, recognized as the Official Weather Bureau the local weather bureau, recognized as the Official Weather Bureau for the construction area. Use the predicted low temperature expected during the next 24 hours.

B. Do not charge frozen material into the mixer at any time.

C. Remove frost or ice from the forms and any steel used in the pavement before placing concrete.

D. Do not place concrete directly on a frozen subgrade. Cover the subgrade with a 12 inch layer of straw or hay to protect it against freezing. Remove the straw or hay from the finished subgrade immediately ahead of paving operations and pile it along the construction line for covering the finished pavement. Clean the subgrade of loose straw and prepare it in a manner satisfactory to Landscape Architect before placing concrete.

Use other covering materials approved by Landscape Architect to prevent subgrade freezing.

E. Add calcium chloride to the mix to accelerate concrete hardening when the air temperature in the shade and away from artificial heat ranges between 40 and 45 degrees F at the rate approved by Landscape Architect. Spread calcium chloride on the materials immediately before discharging them into the mixer drum. Use a method approved by the Landscape Architect to measure the amount of dry calcium chloride added to each concrete batch. Do not place calcium chloride in direct contact with the cement.

F. Immediately after finishing the concrete and as soon as it hardens sufficiently, cover the pavement and keep the protective covering in place until the concrete develops a compressive strength of at least 3,000 psi or for a minimum period of 14 days or as approved by Landscape Architect.

G. Place the protective covering around and over the forms, extending beyond the pavement edge by a distance at least equal to the required depth of covering.

H. When removing forms, the protective covering should be removed for as short a time as possible and should be replaced promptly to prevent loss of heat.

I. Stop mixing and placing concrete each day in sufficient time to finish the concrete and place the required protective covering during daylight hours.

J. The requirements specified herein for the curing and protection of concrete in cold weather are minimum requirements, and Contractor will be responsible for the quality and strength of the concrete placed. Concrete damaged by frost action must be removed and replaced at Contractor's expense.

K. Between October 15 and May 15 , when the predicted low temperature is to be below 35 degrees F at any time within 72 hours after placing the pavement, protect the pavement and keep the protective covering in place until the concrete develops a compressive strength of at least 3,000 psi or for a minimum of 14 days unless otherwise authorized by Landscape Architect.

L. Special Protection:

1. Do not place pavement between October 15 and May 15 unless specifically provided for in the Contract Documents or authorized by Landscape Architect. Do not place concrete when the predicted high temperature falls below the specified limit without written permission from the Landscape Architect. Apply the following requirements when paving is permitted during this period:

    a. Maintain the concrete temperature between 50 and 85 degrees F when placing it on the subgrade.

    b. Heat the mixing water, aggregates, or both as required by Landscape Architect to maintain a mix temperature between 50 and 85 degrees F. Heat the water and aggregates to no more than 150 degrees F.

        1) Heat aggregates using steam pipes under the aggregate piles, free steam discharged into the aggregate piles, or steam pipes in the batching bins.

2) Control heating of the water and aggregates to prevent large temperature differences between batches.

c. Contractor to make sure necessary materials for covering and protecting the concrete, equipment for heating water and aggregates when required, and calcium chloride are on the Project and available for immediate use before placing pavement when the predicted low temperature risks dropping below 35 degrees F.

d. For predicted low temperatures from 35 to 25 degrees F, place either 1-layer of waterproof paper blankets or 12 inches of loose dry straw or hay.

e. For predicted low temperatures of 25 to 20 degrees F, place 1-layer of waterproof paper blankets and 12 inches of loose dry straw or hay.

f. For predicted low temperatures less than 20 degrees F the minimum requirement for cold weather protection will be 1-layer of waterproof paper blankets and 12 inches of loose dry straw or hay overlayed with a waterproof protective covering consisting of tarpaulins, paper blankets, polyethylene sheeting or other approved material.

2. Protect all concrete placed within the preceding 72 hours similarly when temperatures require special protection as specified above.

3. Continue special protection once started until design strength is reached per the above requirements unless warmer temperatures prevail for at least 48 hours. Obtain Landscape Architect approval to eliminate special protection for such a period.

M. Provide protection of the new concrete against cold weather, including ordinary and special protection, at Contractor's expense.

3.23 CONCRETE TEMPERATURE LIMITATIONS

A. Do not place concrete when its temperature at the point of placement exceeds 90 degrees F.

3.24 CURB DROP

A. Provide curb drops for existing and future sidewalk ramps, approaches for existing driveways, and other locations determined by Landscape Architect.

B. Install curb drops for sidewalks according to the current rules and regulations of Act 8, Michigan PA 1973, as amended. Center curb drops for drive approaches with the existing driveway at the property line.

C. Make the width of the residential curb drop equal to the width of the driveway at the property line plus four feet. Unless otherwise approved by Landscape Architect, maintain a minimum width of 14 feet for the residential curb drop.

3.25 SHOULDERS

A. Construct the shoulders according to the lines, grades, and cross section shown on the Plans and as specified for the required shoulder material type. Sequence the shoulders with surfacing operations to complete them no more than 7 days after the curing period expires unless directed otherwise by Landscape Architect.

B. Construct aggregate shoulders as specified under Section 32 11 23 - Aggregate Base Courses, when called for.

3.26 CLEANUP

A. Remove the fixed forms after the concrete gains sufficient strength, but not sooner than 12 hours, and immediately backfill the spaces on both sides with sound earth of topsoil quality.

B. Compact, level, and leave the backfill in a neat, workmanlike condition.

C. At a seasonally correct time approved by Landscape Architect, the disturbed area must be raked, have topsoil placed thereon, and fertilized and seeded per the requirements of Section 32 92 19 - Seeding and sodded in accordance with Section 32 92 23 - Sodding

3.27 OPENING PAVEMENT

A. Landscape Architect reserves the right to require that curing operations be discontinued when the concrete has reached 85% of the design strength, and to require that the shoulders be completed and the slab be opened to traffic.

3.28 MONUMENT BOXES

A. Preserve government, plat, and street intersection monuments within existing or proposed pavement by enclosing them in standard monument boxes.

B. Furnish and install monument box castings.

C. Adjust existing monument boxes to meet the proposed pavement elevation by removing the castings and resetting them to the required elevation.

D. Construct concrete bedding to support the monument box firmly in place.

E. Replace adjacent pavement, curb, or curb and gutter to the new elevation, condition, and construction type unless otherwise provided.

3.29 TESTING

A. During the course of the Work, Landscape Architect may require the taking of standard test cores and cylinders, by a testing laboratory acceptable to Owner and approved by Landscape Architect.

B. Charge Owner for making cylinders, drilling cores, and testing.

C. For each lane of Work:

1. Make at least one (1) cylinder for testing compressive strength for each 500 feet or fraction thereof, or as determined by Landscape Architect.

2. Drill at least two (2) cores for testing compressive strength and checking thickness for each 500 feet or fraction thereof.

D. Conduct slump tests for Portland cement concrete consistency according to ASTM C143/C143M and ASTM C172/C172M.

E. Adjust the unit price for concrete based on the average of three (3) cores when test results on a core indicate a deficiency in thickness or compressive strength, or when test results on a cylinder indicate a deficiency in compressive strength, as follows:

1. Thickness:

Under Required Thickness	Percent of Reduction in Unit Price
0 to 1/4 inch	None
by more than 1/4 but not exceeding 1/2 inch	20
by more than 1/2 but not exceeding 1 inch	50
by more than 1 inch	Remove & Replace

2. Compressive Strength:

Under Required Compressive Strength	Percent of Reduction in Unit Price
0 to 150 psi	None
by more than 150 but not exceeding 300 psi	20
by more than 300 but not exceeding 500 psi	50
by more than 500 psi	Remove & Replace

3. Reduction in the unit price are additive, that is if an area is deficient by 3/8 inch and is under strength by 200 psi, the total reduction is 20% plus 20%, or a reduction of 40%.
4. Determine the area of a deficient core by drilling and testing two (2) additional cores, one (1) on each side of the deficient core and 20 feet from it, when possible.
5. Charge the extra core drilling and testing to Contractor's expense.

END OF SECTION

SECTION 32 13 15
SIDEWALKS AND DRIVEWAYS

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section includes sidewalks, sidewalk ramps, driveways, and drive approaches complete with concrete materials, concrete curing compounds, joint materials, field quality control and appurtenances.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 33 00 - Submittal Procedures

C. Section 31 11 00 - Clearing and Grubbing

D. Section 31 23 13 - Subgrade Preparation

E. Section 32 92 19 - Seeding

F. Section 32 92 23 - Sodding

1.3 REFERENCE STANDARDS

A. Unless otherwise specified, the Work for this Section will conform to the applicable portions of the following:

1. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
2. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
3. ASTM C94/C94M Standard Specification for Ready-Mixed Concrete
4. ASTM C150/C150M - Standard Specification for Portland Cement
5. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
6. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
7. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
8. AASHTO T26 - Standard Method of Test for Determination of Organic Content in Soils by Loss on Ignition
9. MDOT - Michigan Department of Transportation, Standard Specifications for Construction, latest edition.

1.4 SUBMITTALS

A. Obtain written permission for the use of all local disposal sites and furnish copies to the Landscape Architect.

B. Provide, at the request of the Landscape Architect, certification that the various materials to be used conform to the ASTM Standards referred to in the Specification.

1.5 TEST REPORTS

A. Provide two (2) certified copies of the test results of the thickness and compressive strength of the concrete. The core drilling, testing for thickness and compressive strength and the certification of the test results will be performed by a testing laboratory approved by the Landscape Architect.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Comply with the requirements for concrete installation due to outside ambient air temperatures specified under Part 3 of this Section.

1.7 PROTECTION

A. Comply with the requirements for protecting new Work against damage from rain, as specified under Part 3 of this Section.

B. Comply with the requirements for protecting new Work against damage from cold weather, as specified under Part 3 of this Section.

PART 2 PRODUCTS

2.1 CONCRETE

A. Concrete will conform to MDOT Section 1004, use 3,500 psi strength concrete; Type IA cement; MDOT 6A coarse aggregate; MDOT 2NS fine aggregate; 3 inch maximum slump; no admixtures without the Landscape Architect's approval.

B. USe ready-mixed concrete in accordance with ASTM C94/C94M, Alternate 2 unless a written request for other than ready-mixed concrete has been submitted, reviewed and approved by the Landscape Architect.

C. Provide documentation from actual mixes used on projects showing 28 day compressive strength of not less than 3,500 psi when tested under field conditions.

D. Mixes will contain a minimum of 25% Type F fly ash.

1. Water reducers, additional fly ash, ground granulated blast furnace slag (GGBFS), and other pozzolans, may be used when approved by the Landscape Architect.

    a. Fly ash quantity will not exceed 40%;

    b. GGBFS quantity will not be less than 25% and not more than 40%;

    c. Maximum total replacement of cement will not exceed 40%;

    d. GGBFS and fly ash must replace cement on a pound for pound basis.

E. Use air-entraining Portland cement conforming to ASTM C150/C150M, Type 1A. If high-early strength concrete is desired, Type IIIA is required.

F. High-early concrete can be obtained for small areas by the addition of one sack of cement, Type 1A, per cubic yard of concrete (94 lbs/cyd).

G. Air content of the concrete will be 6.5% ± 1.5% by volume.

2.2 WATER

A. Water to be used for mixing and curing concrete will be reasonably clean and free from oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.

B. Waters from sources approved by the Michigan State Department of Public Health as potable may be used without test.

C. Water requiring testing will be tested in accordance with the current Method of Test for Quality of Water to be Used in Concrete in AASHTO T26, and as specified in MDOT, Section 911.

2.3 CONCRETE CURING COMPOUNDS

A. White membrane curing compound for curing concrete will conform to ASTM C309, Type 2, Class B Vehicle, and as specified in MDOT, Section 911.

2.4 PREMOLDED JOINT FILLER

A. Fiber joint filler for expansion joints will conform to ASTM D1751. Filler will be of the thickness, as specified herein or on the Plans, or as approved by the Landscape Architect.

2.5 STEEL HOOK BOLTS

A. Hook bolts will conform to ASTM A706/A706M, or Grade 60 of ASTM A615/A615M, or ASTM A996/A996M. Hook bolts will be 5/8 inch (16 mm) diameter.

2.6 JOINT SEALANT

A. Hot-poured type joint sealant will conform to ASTM D6690, Type II, and as specified in MDOT Section 914.04.

PART 3 EXECUTION

3.1 VERIFICATION OF EXCAVATION AND FORMING

A. Prior to the installation of any concrete, examine the excavation and forms for the proper grades, lines, and levels required to receive the new Work. Ascertain that excavation and compacted subgrades are adequate to receive the concrete to be installed.

B. Correct defects and deficiencies before proceeding with the Work.

3.2 EXISTING IMPROVEMENTS

A. Investigate and verify location of existing improvements to which the new Work is to be connected.

B. Adjustments in line and grade to align the new Work with the existing improvements must be approved by the Landscape Architect prior to any change.

3.3 FORMING

A. Forms will be of wood or metal, straight and free from warp, clean, and of sufficient strength to resist springing during the process of depositing concrete against them.

B. Forms will be the full depth of the concrete.

3.4 SIDEWALKS, SIDEWALK RAMPS, DRIVEWAYS, AND DRIVEWAY APPROACHES

A. Unless otherwise noted in the Contract Documents, sidewalks and sidewalk ramps will be 4 inches thick except at driveways, where the thickness of the sidewalks will be 6 inches.

B. Sidewalks will be 5 feet wide, unless otherwise noted on Plans, and slope 1/4 inch/ft towards the surface drainage side, which in general will be towards the center of the road. Sidewalks will be located within the right-of-way, parallel the property lines, at a distance of 1 foot from the property line, unless otherwise shown on the Plans or as determined by the Landscape Architect.

C. Driveways and approaches will be 6 inches thick. The width of driveways and driveway approaches will be as specified on the Plans or as determined by the Landscape Architect.

3.5 REMOVE CURB FOR CURB DROP

A. Construction of sidewalk ramps within street intersections where curbed pavement exists will conform to the current rules and regulations of Act 8, Michigan PA 1973.

B. Where there is no proper curb drop for the sidewalk ramp or driveway approach, saw cut, to full depth of pavement, and remove a minimum of an 18 inch wide curb and gutter section. When mountable curbs are present, remove a 24 inch wide curb and gutter section for the construction of sidewalk ramp, as specified herein.

C. The length of curb and gutter removal will be determined by the Landscape Architect in the field but will be at least as wide as the proposed sidewalk ramp plus 1 foot on each side.

D. The removed curb and gutter section will be replaced with material, equal to what was removed and the joint sealed with hot poured rubber asphalt.

E. Install 5/8 inch diameter self-tapping hook bolts, in the existing concrete pavement as indicated on the Plans, prior to placing concrete for the removed curb and gutter section.

F. Curbs may be cut or ground down with an approved concrete grinder when the final results will leave the cut or ground down curb in a smooth, clean condition acceptable to the Landscape Architect. Curbs that are cut or ground down that are not acceptable to the Landscape Architect, will be removed and replaced at Contractor's expense.

3.6 PLACEMENT OF FORMS

A. Wood forms, straight and free from warp, of nominal depth may be used for sidewalk sections less than 25 feet in length.

B. Stake forms to line and grade in a manner that will prevent deflection and settlement.

C. When unit slab areas are to be poured, slab division forms will be placed so that the slab division joints will be straight and continuous.

D. Set forms for sidewalk ramps to provide a grade toward the centerline of the right-of-way in accordance with current standards. The grade must be uniform, except as may be necessary to eliminate short grade changes.

E. Oil forms before placing concrete. Forms will remain in place at least 12 hours after the concrete is placed. Ensure sufficient forms are placed ahead of the pouring operations to maintain uninterrupted placement of concrete.

F. The use of slip form pavers can be allowed when approved by the Landscape Architect in lieu of the construction system described above.

3.7 JOINTS

A. Transverse and longitudinal expansion and plane-of-weakness joints will be constructed at the locations specified herein, as indicated on the Plans, or as approved by the Landscape Architect.

B. Place transverse expansion joints for the full width and depth of the new Work. The transverse expansion joints placed against any existing pavement must be a minimum of 6 inches deep, but no less than the thickness of the concrete being placed.

C. Longitudinal expansion joints must conform to the same requirements as transverse expansion joints.

D. Construct joints true to line with their faces perpendicular to the surface of the sidewalk. The top will be slightly below the finished surface of the sidewalk. Construct transverse joints at right angles to the centerline of the sidewalk, and longitudinal joints parallel to the centerline, or as determined by the Landscape Architect.

E. Unless otherwise specified on the Plans or unless otherwise determined by the Landscape Architect, when the sidewalk is constructed in partial width slabs, transverse joints in the succeeding slabs will be placed in line with like joints in the adjacent slab. Also, in the case of widening existing sidewalks, place transverse joints in line with like joint in the existing sidewalk.

F. Place transverse expansion joints, 1/2 inch thick, through the sidewalk at uniform intervals of not more than 50 feet and elsewhere as shown on the Plans, or as determined by the Landscape Architect.

G. Place expansion joints, 1/2 inch thick, between the sidewalk and back of abutting parallel curbs, buildings or other rigid structures; concrete driveways and driveway approaches.

H. Place expansions joint between sidewalks and buildings 1 foot from the property line and parallel to it.

I. Place expansion joints, 1 inch thick, between sidewalk ramps or driveway approaches and the back of curbs.

J. Form plane-of-weakness joints every 5 feet using slab divisions forms extending to the full depth of the concrete or by cutting joints in the concrete, after floating, to a depth

equal to 1/4 the thickness of the sidewalk. The cut joints will not be less than 1/8 inch nor more than 1/4 inch in width and will be finished smooth and will be at right angles to the centerline of the sidewalk.

3.8 PLACING AND FINISHING CONCRETE

A. Place concrete on a prepared unfrozen, smooth, leveled, rolled and properly compacted base as indicated on the Plans. Moisten the surface of the subbase; no visible water is to be present prior to placement of the concrete.

B. Deposit concrete in a single layer, to the depth specified here in or shown on the Plans. Concrete will be thoroughly spaded or vibrated and compacted to fill in voids along the forms and joints. Concrete will be struck off with a strike board until voids are removed and the surface has the required grade and cross section as indicated on the Plans.

C. Float the surface of the concrete produce a smooth surface free from irregularities. Round edges and joints with an edger having a 1/4 inch radius. Broom the surface of sidewalks, driveways and approaches to slightly roughen the surface.

D. Provide texture on the surface of sidewalk ramps using a coarse broom transversely to the ramp slope. The texture on sidewalk ramps will be coarser than the remainder of the sidewalk.

3.9 CURING

A. After finishing operations have been completed and immediately after the free water has left the surface, the surface of the concrete (and sides if slip-forming is used) must be completely coated and sealed with a uniform layer of white membrane curing compound. Do not thin the curing compound. Apply the curing compound at the rate of 1 gallon per 200 square feet of surface.

3.10 BARRICADES

A. Place suitable barricades and lights around newly poured sidewalks, sidewalk ramps, driveways, driveway approaches and curb and gutter section to protect the new Work from damage from pedestrians, vehicles and others until the concrete has hardened.

B. Leave barricades in place for a minimum of two (2) days, except for driveway approaches and curb and gutter section where barricades are to remain in place for a minimum of three (3) days.

C. Remove and replace concrete that suffers surface or structural damage at the Contractor's expense.

3.11 PROTECTION

A. Protect the new concrete from the effects of rain before the concrete has sufficiently hardened. Contractor will have available on the job site enough burlap or 6 mil polyethylene film to cover and protect the work.

1. When rain appears eminent, concrete operations will stop and personnel will begin covering. As soon as the rain ceases, uncover the concrete.

2. Apply curing compound to areas where the compound has been disturbed or washed away.

B. If concrete is placed between October 15 and May 15, provide a sufficient amount of clean, dry straw or hay to cover one day's production.

1. Place hay or straw a minimum of 12 inches if the temperature reaches 40 degrees F and is falling immediately after the curing compound is applied.
2. Place a 6 mil polyurethane film on concrete if the temperature is 30 degrees F and falling as soon as the surface moisture has disappeared, then covered with a minimum of 12 inches of straw or hay.
3. Whenever the temperature in the shade falls below 50 degrees F, the water, sand and coarse aggregate will be heated in that order sufficiently to maintain a uniform temperature of the concrete between 70 to 80 degrees F.

C. Do not place concrete when the temperature of the concrete at the point of placement is above 90 degrees F.

3.12 CLEANUP

A. Remove the fixed forms after the concrete has gained sufficient strength, but no sooner than within 12 hours, and immediately backfill the spaces on both sides with sound earth of topsoil quality. Compact backfill, level and leave in a neat condition.

B. At a seasonally correct time approved by the Landscape Architect, rake the disturbed area then place topsoil. Fertilize and seed per the requirements of Section 32 92 19

3.13 TESTING

A. Landscape Architect may require that a minimum of two cores be drilled from the sidewalk for each 500 linear foot (or fraction thereof) section placed. At least one (1) core out of two (2) required will be taken from the sidewalk at the driveway.

B. One (1) core may be required for every 20 driveway approaches or sidewalk ramps installed.

C. Check cores for depth and compressive strength.

1. Core drilling and tests will be done by a testing laboratory designated by the Owner and at the expense of the Contractor.
2. Furnish two certified copies of the test results from the testing laboratory to the Landscape Architect.

D. In the event the test results on a core indicates a deficiency in either thickness or compressive strength the following adjustments in the unit price for concrete will be made:

1. Thickness

Under Required Thickness	**Percent of Reduction in Unit Price**
0 to 1/4 inch	None

more than 1/4 but not exceeding 1/2 inch	20
more than 1/2 but not exceeding 1 inch	50
more than 1 inch	Remove & Replace

2. Compressive Strength

Under Required Compressive Strength	**Percent of Reduction in Unit Price**
o to 150 psi	None
more than 150 but not exceeding 300 psi	20
more than 300 but not exceeding 500 psi	50
more than 500 psi	Remove & Replace

E. The area of the deficient core will be determined by the drilling and testing of two (2) additional cores, one (1) on each side of the deficient core and 20 feet from it when possible.

1. The extra core drilling and testing will be at the expense of the Contractor.
2. Reductions due to deficiencies in thickness or compressive strength are additive, that is, if an area is deficient by 3/8 inch and under strength by 200 psi, the total reduction is 20% plus 20% or 40% reduction.

END OF SECTION

SECTION 32 15 00
AGGREGATE SURFACING

PART 1 GENERAL

1.1 SCOPE

A. This section includes the requirements for constructing aggregate surfacing.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 89 00 - Site Construction Performance Requirements

C. Section 32 12 16 - Bituminous Paving

D. Section 32 13 13 - Concrete Paving

E. Section 32 92 19 - Seeding

F. Section 32 92 23 - Sodding

1.3 REFERENCE STANDARDS

A. Conform to the applicable portions of the following Standard Specifications for this Section, unless otherwise specified.

1. ASTM D98: Standard Specification for Calcium Chloride
2. ASTM D1557: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))
3. AASHTO: American Association of State Highways and Transportation Officials
4. MDOT: Michigan Department of Transportation, Standard Specifications for Construction, latest edition

1.4 ALLOWABLE TOLERANCES

A. Shape the finished surface to conform to plan grade and cross section within a tolerance of 3/4 inch in 10 feet.

1.5 TEST REPORTS

A. The testing lab must provide the Landscape Architect with two (2) certified copies of the test results of the thickness of the compacted aggregate. Perform core drilling, testing for thickness, and certification of the test results through a testing laboratory approved by the Landscape Architect.

1.6 STOCKPILING AGGREGATE

A. Deposit aggregate in stockpiles in a manner that allows for removal using methods that ensure a uniform gradation of the material.

B. Stockpiling of aggregate, in excess of 4 feet in depth, on the completed subbase or aggregate surface will not be permitted, except with the approval of the Landscape Architect.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Comply with the requirements for aggregate base or surfacing installations due to outside ambient air temperatures specified under Part 3 of this Section.

PART 2 PRODUCTS

2.1 DENSE-GRADED AGGREGATE

A. Ensure the dense-graded aggregate gradation conforms to 22A or 23A as specified in MDOT Section 902.05.

2.2 CALCIUM CHLORIDE ADDITIVES

A. Ensure the calcium chloride additives conform to ASTM D98 and the specifications in MDOT, Section 903.04.

2.3 WATER

A. Use water for compaction and dust control that is reasonably clean and free from substances harmful to the finished product. Water from sources approved by the Michigan State Department of Public Health as potable may be used.

PART 3 EXECUTION

3.1 EXCAVATION VERIFICATION

A. Prior to the placing of any aggregate material, examine the excavation for the grades, lines, and levels required to receive the new Work. Ascertain that all excavation and compacted subgrades or subbases are adequate to receive the new Work. Correct all defects and deficiencies before proceeding with the Work.

3.2 SUBGRADE CONDITIONS

A. Prior to the placing of any aggregate material, examine the subgrade or subbase to assure that it is adequate to receive the aggregate to be placed. If the subgrade or subbase remains wet after all surface water has been removed, the Landscape Architect may require the installation of edge drain.

3.3 EXISTING BASE

A. Prior to the placing of any aggregate material for surfacing, examine the existing base for grade and condition to receive the new Work. Ascertain that the base is adequately compacted to receive the aggregate surfacing to be installed.

B. Correct all defects and deficiencies before proceeding with the Work.

3.4 EXISTING IMPROVEMENTS

A. Investigate and verify locations of existing improvements, including structures, to which the new Work will be in contact.

B. Necessary adjustments in line and grade, to align the new Work with the existing improvements, must be approved by the Landscape Architect, prior to any changes.

3.5 PREPARATION OF SUBGRADE OR SUBBASE

A. Fine grade the subgrade or subbase to the cross section indicated on the Plans, and thoroughly compact it before placing the aggregate material.

3.6 INSTALLATION - GENERAL

A. Indicate the width, thickness, and type of aggregate materials on the Plans or as determined by the Landscape Architect.

B. Do not place any aggregate material until the subgrade, subbase, or existing aggregate surface has been approved by the Landscape Architect.

3.7 AGGREGATE SURFACE COURSE

A. Grade or scarify the existing aggregate surface to remove irregularities and provide a bond between the old and new surfaces, where the base for the new aggregate surface course is an existing aggregate surface.

B. Place the aggregate surface course using a mechanical spreader or other approved means, in uniform layers to a depth that, when compacted, achieves the thickness shown on the Plans.

C. Ensure the depth of the surface course, when compacted, does not exceed 6 inches, unless otherwise specified on the Plans or approved by the Landscape Architect.

1. Place the aggregate as a uniform mixture on the prepared base. Spread it uniformly, then trim with a road grader, trimmer, or other approved means until the surface is free from waves and irregularities.

2. Alternate trimming with rolling using a pneumatic-tired or tamping-type roller. Continue the entire operation until the surface course is compacted to at least 95% of its maximum unit weight.

D. Ensure the surface course conforms to the required lines, grades, and cross sections upon completion of the operation.

E. Maintain the optimum moisture content until the prescribed unit weight is achieved. Compact each layer to attain the maximum unit weight before placing the succeeding layer.

F. When approved by the Landscape Architect, additional water may be applied by an approved means, to the aggregate to aid in the compaction and shaping of the material.

G. With the approval of the Landscape Architect, chloride additives may be used by the Contractor to facilitate his compaction and maintenance of the aggregate surface. The amount and method of combining the chloride additives are at the option of the Contractor and are at his expense.

3.8 AGGREGATE SHOULDERS AND APPROACHES

A. Construct the shoulders and approaches using the material, width, and depth as shown on the Plans.

B. Ensure shoulders and approaches conform to MDOT, Section 307 for the specified class, whether Class I, Class II, Class III or Class IV.

C. Grade the subgrade for the shoulders and approaches to an elevation below the finished surface, allowing for the placement of the specified thickness of materials.

D. Obtain approval from the Landscape Architect for the subgrade of shoulders and approaches before placing the aggregate.

E. Place the aggregate on the prepared subgrade using a mechanical spreader or other approved means, to a depth of no more than 5 inches. If the specified thickness exceeds 5 inches, construct the shoulder or approach in two or more courses.

F. Dumping the aggregate on the road surface and grading it onto the shoulder or approach will not be permitted.

G. Compact the aggregate to no less than 100% of the maximum unit weight for the first 5 feet outside of the pavement edge and 98% for the remainder of the area. Upon completion, ensure the surface course conforms to the required lines, grades, and cross sections.

H. Scarify the existing aggregate shoulder or approach prior to placing new aggregate materials on resurfacing projects.

1. Place the aggregate before applying the top course of bituminous mixture on the adjoining pavement.

2. Perform final shaping and compaction of the shoulder or approach after placing the top course of bituminous mixture, unless the Landscape Architect directs otherwise.

I. Maintain the optimum moisture content until the prescribed unit weight is achieved. Compact each layer until the maximum unit weight is attained before placing the next layer.

J. When approved by the Landscape Architect, additional water may be applied by an approved means, to the aggregate to aid in the compaction and shaping of the material.

K. With the approval of the Landscape Architect, chloride additives may be used by the Contractor to facilitate his compaction and maintenance of the aggregate surface. The amount and method of combining the chloride additives are at the option of the Contractor and are at his expense.

3.9 MAINTENANCE DURING CONSTRUCTION

A. Maintain the aggregate surface in a smooth and firm condition throughout all phases of the construction operation.

B. Provide additional materials to fill depressions or bind the aggregate at the Contractor’s expense.

3.10 TEMPERATURE LIMITATIONS

A. Do not place aggregate materials if there are indications that the mixtures may freeze before achieving the required density.

B. Do not place the aggregate on a frozen subgrade or base course without prior approval from the Landscape Architect.

3.11 CLEANUP

A. Immediately after compacting the surface course, backfill the voids on both sides of the aggregate course with sound earth of topsoil quality.

B. Compact, level, and leave the backfill in a neat, workmanlike condition.

C. At a seasonally correct time approved by the Landscape Architect, the disturbed area must be raked, have topsoil placed thereon, fertilized and seeded per the requirements of Section 32 9219, Seeding, sodded in accordance with Section 32 9223, Sodding, or ____.

3.12 OPENING AGGREGATE SURFACED ROADS

A. The Landscape Architect reserves the right to open the aggregate surfacing to traffic at any time during construction.

3.13 MONUMENT BOXES

A. Preserve all government, plat, and street intersection monuments within existing or proposed pavement by enclosing them in standard monument boxes.

1. Furnish and install monument box castings by the Contractor, using East Jordan Iron Works No. 1570 or an approved equal.

B. Adjust existing monument boxes to meet the proposed pavement elevation by removing the castings and resetting to the required elevation. Support the monument box with concrete bedding, ensuring it remains firmly in place. Replace the adjacent pavement, curb, or curb and gutter to the new elevation, condition, and kind of construction, unless otherwise specified.

3.14 TESTING

A. Require testing for compaction, density, and material thickness during the course of the Work as directed by the Landscape Architect. Perform the testing and coring through a testing laboratory acceptable to the Owner and approved by the Landscape Architect.

1. Charge the cost for testing and coring to the Owner.

B. When thickness tests are done, a minimum of one depth (thickness) measurement will be made every 400 feet of traffic lane.

1. Set the lane width as indicated on the Plans or as determined by the Landscape Architect. If constructing two (2) lanes simultaneously, conduct only one test to represent both lanes.

2. For areas such as intersections, entrances, cross-overs, ramps, widening strips, acceleration and deceleration lane, at least one depth measurement will be taken for each 1,200 square yards of such areas (or fraction thereof).

3. The location of the depth measurement will be at the discretion of the Landscape Architect.

C. Understand the maximum unit weight, when used as a measure of compaction or density of soils, to mean the maximum unit weight per cubic foot (or cubic meter) as determined by ASTM D1557, Method C.

3.15 DEFECTIVE WORK

A. Thickness

1. Measurements of aggregate base and/or surface course thickness will be made to the nearest 1/4 inch.
    a. Allow depths to be 1/2 inchless than the thickness indicated on the Plans, provided the average of all measurements taken at regular intervals equals or exceeds the specified thickness.
    b. In determining the average in place thickness, measurements which are more than 1/2 inch in excess of the thickness indicated on the Plans will be considered as the specified thickness plus 1/2 inch.
2. Specify the locations of the depth measurements as outlined herein, unless the Landscape Architect. determines otherwise. Correct sections found deficient in depth using methods approved by the Landscape Architect.

B. Weight
1. Moisture tests will be made at the start of weighing operations and at any time thereafter when construction operations, weather conditions or any other cause may result in a change in the moisture content of the material.
    a. When the aggregate material is measured by weight in Tons (or metric tons), the pay weights for aggregates will be the scale weight of the material, including admixtures, unless the moisture content is more than six (6) percent.
    b. If the tests indicate a moisture content in excess of six (6) percent, the excess over six (6) percent will be deducted from the scale weight of the aggregate until such time as moisture tests indicate that the moisture content of the material is not more than six (6) percent.

END OF SECTION

SECTION 32 31 00
FENCES AND GATES

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section includes the types of fencing work indicated on the Plans complete with layout of the Work, excavation and backfill, concrete foundation, fence framing and fabric, pickets and privacy slats, gates and hardware, and hardware adjustment and lubrication.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 33 00 - Submittal Procedures

C. Section 01 89 00 - Site Construction Performance Requirements

1.3 REFERENCE STANDARDS

A. Conform the Work of this Section to the applicable portions of the following Standards, unless otherwise specified.

1. ASTM A53/A53M:Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
2. ASTM A116: Standard Specification for Metallic-Coated, Steel-Woven Wire Fence Fabric
3. ASTM A121: Standard Specification for Metallic-Coated Carbon Steel Barbed Wire
4. ASTM A123/A123M: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
5. ASTM A153/A153M: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
6. ASTM A392: Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric
7. ASTM A491: Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric
8. ASTM A499: Standard Specification for Steel Bars and Shapes, Carbon Rolled from “T” Rails
9. ASTM A641/A641M: Standard Specification for Zinc–Coated (Galvanized) Carbon Steel Wire
10. ASTM A780/A780M: Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
11. ASTM A817: Standard Specification for Metallic-Coated Steel Wire for Chain-Link Fence Fabric and Marcelled Tension Wire
12. ASTM A853: Standard Specification for Steel Wire, Carbon, For General Use

13. ASTM C1107/C1107M: Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
14. ASTM F537: Standard Specification for Design, Fabrication, and Installation of Fences Constructed of Wood and Related Materials
15. ASTM F567: Standard Practice for Installation of Chain-Link Fence
16. ASTM F668: Standard Specification for Polyvinyl Chloride (PVC), Polyolefin and Other Polymer- Coated Steel Chain Link Fence Fabric
17. ASTM F900: Standard Specification for Industrial and Commercial Swing Gates
18. ASTM F934: Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials
19. ASTM F1043: Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework
20. ASTM F1083: Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures
21. ASTM F1184: Standard Specification for Industrial and Commercial Horizontal Slide Gates
22. ASTM F1910: Standard Specification for Long Barbed Tape Obstacles
23. AWPA M4: Standard for the Handling, Storage, Field Fabrication and Field Treatment of Preservative-Treated Wood Products
24. AWPA U1: Use Category System: User Specification for Treated Wood
25. CLFMI-PM 2445: Chain Link Fence Manufacturers Institute, Product Manual (latest edition)
26. FS - Federal Specifications
27. MDOT - Michigan Department of Transportation, Standard Specifications for Construction, latest edition
28. NOMMA: National Ornamental & Miscellaneous Metals Association
29. PS 20: American Softwood Lumber Standard
30. SSPC-PA 1: Paint Application Specification No. 1: Shop, Field, And Maintenance Painting of Steel
31. U.S. Code Title 42, Section 300i-1: Tampering with Public Water Systems

1.4 SUBMITTALS

A. General:

1. Submit manufacturer's literature showing standard details of fence and gate materials.
2. Submit Shop Drawings showing details of fence and gate fabrication and installation. Include plans, elevations, sections, details, and attachments to other work.

B. Product Test Reports:

1. Chain Link Fence: Framework strength according to ASTM F1043, for tests performed by manufacturer and witnessed by a qualified testing agency.

2. Ornamental Fence: For decorative metallic-coated-steel tubular picket fences, including finish, indicating compliance with referenced standard only if requested.

1.5 QUALITY ASSURANCE

A. Field Measurements: Verify layout information for fences and gates shown on the Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.6 WARRANTY

A. General Warranty:

1. The Special Warranty specified in this Article does not deprive the Owner of other rights or remedies under the Contract Documents. It is in addition to, and runs concurrent with, other warranties made by the Contractor. The Contractor's obligations under the Contract Documents are not limited by the provisions of the specified Special Warranty.

B. Special Warranty:

1. Provide manufacturer’s written warranty, running to the benefit of the Owner, agreeing to correct, or at option of the Owner, remove or replace materials or equipment specified in this Section found to be defective during a period of five (5) years after the date of Substantial Completion.

a. Installer agrees to repair or replace components of fences and gates that fail in materials or workmanship within specified warranty period.

b. Failures include, but are not limited to, the following:

1) Failure to comply with performance requirements.

2) Deterioration of metals, metal finishes, and other materials beyond normal weathering.

PART 2 PRODUCTS

2.1 GENERAL

A. Fabricate framing members for fence and gate framing from the types and sizes of steel framing indicated on the Plans and as specified in this Section. At a minimum, ensure framing members conform to the requirements in Part 2 of this Section.

B. Coat framing members, posts, rails, and accessories with PVC when the fence fabric is PVC coated.

C. Use hot-dipped galvanized steel tubular materials for tubular sections, conforming to ASTM A53/A53M for weight and coating. Steel tubular framing may be welded or seamless steel pipe, reasonably straight and free from injurious defects. Remove burrs at the ends of the pipe. Ensure the average weight of the finished steel pipe is no less than 95% of the specified weight, including the weight of galvanizing.

D. Fabricate structural and roll-formed steel shapes conforming to ASTM A499, hot-dipped galvanized in accordance with ASTM A123/A123M. Use new rail steel billets of the specified weights and galvanized. Ensure the weight of the zinc coating on the actual surface averages no less than 2.0 oz per sft, with no individual specimen showing less than 1.8 oz per sft. Include the weight of the zinc coating in the specified weight for structural and roll-formed shapes, except that any zinc galvanizing over 4.0 oz. per sft of surface will be deducted from the weight.

2.2 POSTS AND RAILS

A. Use round pipe or square roll-formed sections for posts, conforming to the dimensions and weights specified herein.

B. Hot-dip galvanize round posts with a minimum average zinc coating of 1.8 oz per sft, meeting ASTM F1083 for standard weight (Schedule 40) galvanized pipe.

C. Produce rolled form sections from steel with a minimum yield strength of 45,000 PSI, ensuring they meet the strength and protective coating requirements of ASTM F1043.

D. Intermediate Posts

1. Use round or square intermediate posts conforming to the following weights and dimensions (O.D.):

a. For fabric 6.0 feet or less: 1.9 inch diameter round weighing 2.72 lbs per ft

b. For fabric 7 - 10 feet: 2.375 inch diameter round, weighing 3.65 lbs per ft; or 2 inch square weighing 2.60 lbs per ft.

c. For fabric over 10 feet: 2.875 inch diameter round weighing 5.79 lbs per ft; or 2.5 inch square weighing 5.10 lbs per ft.

E. Terminal Posts, Angle Posts, Pull Posts and Brace Posts

1. Round or square conforming to the following weights and dimensions (O.D.):

a. For fabric 6.0 feet or less: 2.375 inch diameter round, weighing 3.65 lbs per ft; or 2 inch square weighing 2.60 lbs per ft.

b. For fabric 7 - 10 feet: 2.875 inch diameter round weighing 5.79 lbs per ft; or 2.5 inch square weighing 5.10 lbs per ft.

c. For fabric over : 2.375 inch diameter round weighing 8.65 lbs per ft; or 2.5 inch square weighing 5.10 lbs per ft.

F. Gate Posts

1. Use round or square gate posts conforming to the weights and dimensions (O.D.) specified in Table A.

G. Top Rail, Bottom Rail, and Middle Rail

1. Round pipe: 1.66 inch diameter weighing 2.27 lbs per ft.

2. Ensure top rail lengths are no less than 18 feet, fitted with couplings or swedged for connecting lengths into a continuous run. Use couplings no less than 6 inches with a

minimum wall thickness of 0.07 inch, allowing for expansion and contraction of the rail.

2.3 BRACING TRUSS

A. Diagonal truss: 3/8 inch nominal diameter rod with adjustable take-up.

2.4 ACCESSORIES

A. Use malleable iron or heavy pressed steel for post tops, extension arms, stretcher bars, rail ends, and appurtenances, galvanized in accordance with ASTM A153/A153M.

B. Provide post tops on fences with a top rail that include a hole suitable for passing the top rail through the post top. Ensure the post top fits over the outside of the post with a weathertight closure.

C. Use extension arms for supporting barbed wire that are either single or "V" type, as shown on the Plans. Extend the arms from the top of the post at an angle of approximately 45 degrees, ensuring the arms are integral with the post tops. The extension arms must carry three (3) barbed wires, equally spaced, with the topmost wire approximately 12 inches above the fence fabric.

D. Use stretcher bars as one-piece lengths equal to the full height of the fence fabric. Secure them with bands approximately 1 inch wide, featuring beveled edges, to attach the stretcher bars to end, corner, pull, and gate posts.

2.5 WOVEN WIRE FABRIC

A. Fabricate woven wire fabric in accordance with the best commercial practices. Ensure the overall width of the fabric is no less than 46-1/2 inches. Space fabric stays uniformly on 6-1/4 inch centers maximum.

B. Ensure galvanized steel woven wire fabric conforms to ASTM A116, No. 11 Farm Fencing, Design Number 1047-6-11, Grade 60, Class I, Zinc Coating.

C. Ensure aluminum-coated steel woven wire fencing conforms to ASTM A116, No. 11 Farm Fencing, Design Number 1047-6-11, Class I, Aluminum Coating.

2.6 CHAIN LINK FABRIC

A. Ensure the fabric is zinc (galvanized) coated, vinyl coated, or aluminum coated. Galvanize zinc-coated fabric after weaving.

B. Unless otherwise indicated on the Plans or directed by the Landscape Architect, use 11 gauge, zinc-coated steel chain link fabric, regardless of type. Make the mesh two 2 inch. Knuckle both selvages on fabric 72 inches in height and over. Knuckle the top selvage on fabric less than 72 inches in height.

C. Conform Zinc-Coated Steel Chain-Link Fence Fabric to ASTM A392, Class 2 Coating.

D. Conform Aluminum-Coated Steel Chain-Link Fence Fabric to ASTM A491, and ASTM A817.

E. Conform Vinyl-Coated Steel (Extruded Vinyl over Galvanized Steel Wire) Chain-Link Fence Fabric to ASTM F668, Class 2a.

F. Conform Fused Vinyl-Coated Steel (Thermally Fused Vinyl Coating over Galvanized Steel Wire) Chain-Link Fence Fabric to ASTM F668, Class 2b.

2.7 OUTRIGGERS AND BARBED WIRE

A. Extend chain link fence posts on the gate at SCS-2 and SCS-3 locations if the existing gate is removed, allowing installation of three (3) strands of barbed wire as previously provided on the existing gate.

B. Conform chain link fence barbed wire to ASTM A240/A240M, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and General Applications, or equivalent.

C. Fabricate barbed wire from 2-strand, 12-1/2 gauge zinc-coated steel wire (Type Z, Class 3) with 4-point, 14-gauge round barbs spaced on 5 inch centers, conforming to Design Number 12-4-5-14R of ASTM A121. Galvanize the wire after fabrication.

2.8 TENSION WIRE

A. Use No. 7 gauge ASTM A824 tension wire with a Type I aluminum coating, a Type II, Class 2 zinc coating, or hot-dip with a Type II, Class 1 galvanized coating followed by a thermally fused vinyl coating. Ensure the tension wire has a minimum breaking strength of 1950 pound-force.

2.9 FABRIC FASTENERS

A. Use No. 12 gauge minimum fasteners for securing fabric to framing members, galvanized, aluminum-coated, or vinyl-coated as compatible with the fabric.

B. Use 11-gauge minimum hog rings, galvanized, aluminum, or vinyl-coated as compatible with the fabric.

C. Ensure coatings for fasteners conform to the requirements of ASTM A641/A641M, Class III.

2.10 WOOD POSTS

A. Accept wood posts only when woven wire fencing is specified on the plans or in the Proposal. Use Cedar, Red Oak, White Oak, Beech, Hard Maple, White Ash, Yellow Birch, Norway Pine, Northern White Pine, or other species acceptable to the Landscape Architect.

B. Cut posts from timber seasoned by stacking in a manner acceptable to the Landscape Architect. Ensure the timber is at least No. 3 Grade Southern Pine.

2.11 WOOD FRAMING, PICKETS, AND GATES

A. Ensure framing pickets and gates used in woven wire fencing conform to the requirements of PS 20 or the specific application described in ASTM F537. Use wood bracing of Cedar Oak or other approved wood poles, not less than 4-1/2 inches in diameter.

2.12 WOOD PRESERVATIVES

A. Apply the applicable requirements of AWPA U1, Section 6, Commodity Specification A, Use Category 4B for all preservative pressure-treated wood fencing materials.

B. Ensure brush-coated treatment of wood fencing materials conforms to the applicable portions of AWPA M4.

C. Oil-born treatment of wood fencing materials is not acceptable.

2.13 METAL FASTENERS FOR WOVEN WIRE FENCING

A. Use corrosive-resistant metal fasteners in the construction and installation of woven wire fencing, conforming to ASTM F537 unless otherwise indicated on the Plans. Ensure staples are No. 9 gauge steel wire, 1-1/2 inches minimum for softwood and 1 inch minimum for hardwood.

2.14 PRIVACY SLATS

A. Use privacy slats of the type and sizes indicated on the Plans where shown.

B. Grade and finish wood for privacy slats as recommended by the California Redwood Association for landscaping wood.

2.15 GATES

A. Fabricate frames for gates from zinc-coated steel in accordance with ASTM F1043. Coat welded joints in accordance with Practice ASTM A780/A780M using a zinc-rich primer. Provide gates with intermediate braces and truss rods of sufficient strength to form a rigid frame without twist or sag. Ensure members do not sag in excess of the lesser of 1% of the gate leaf width or 2 inches.

B. Ensure gate frame members comply with Table B, at a minimum.

C. Use fabric for gates that matches the fabric used for fencing, unless otherwise indicated on the Plans. Install fabric with stretcher bars at vertical edges and tie wires at top and bottom edges.

D. Install stretcher bars to gate frame at not more than 15 inch centers. Attach hardware with approved fasteners that will provide security against removal or breakage.

E. Use non-lift-off type hinges, offset to permit a 180-degree gate opening. Ensure hinges are structurally capable of supporting the gate leaf and allow the gate to open and close without binding. Design hinges to permit the gate to swing a full 180 degrees.

F. Use a forked or plunger bar type latch with an integral padlock eye, ensuring it is operable from either side of the gate.

G. Provide a keeper where required that automatically engages the gate leaf and holds it in the open position until manually released. Install keepers on each gate leaf over 5 feet.

H. Provide double gates with mushroom-type or flat plate gate stops and anchors. Design stops to engage the center drop rod or plunger bar of both leaves.

I. Ensure sliding gates comply with ASTM F1184. Use horizontal slide gates supported only from above or cantilever slide gates spanning an opening without top or bottom support, as indicated on the plans. Supply cantilever slide gates with zinc-coated steel frames, using external or internal rollers per ASTM F1184.

2.16 CONCRETE

A. Conform concrete to MDOT Section 1004; use 3,000 psi strength; Type IA cement; MDOT 6A coarse aggregate; MDOT 2NS fine aggregate; 3 inch maximum slump; no admixtures without Landscape Architect's approval.

PART 3 EXECUTION

3.1 FINAL GRADING

A. Verify that final grading in the area to receive fencing has been completed. Ensure grades are without irregularities that would interfere with the fence installation. Report any discrepancies in final grades that would affect the new Work to the Landscape Architect. Do not commence Work until all unsatisfactory conditions have been corrected.

3.2 MEASUREMENT AND LAYOUT

A. Measure and layout the complete fence line as indicated on the Plans. Measure all dimensions for fence installation parallel to the surface of the ground.

B. Do all locating and marking of fencing post positions. Locate line posts at equal spacings, center to center, as indicated on the Plans and specified in this Section. Locate and mark corner post positions at changes in fencing runs exceeding 30 degrees.

3.3 INSTALLATION - GENERAL

A. Install fencing and gates to meet the requirements of ASTM F567 and CLFMI CLF 2445. Ensure all work follows best trade practices, demonstrates excellent workmanship, and is in a manner acceptable to the Landscape Architect. Make sure the finished fence is plumb, taut, true to line and ground contour, and rigidly secured in position.

3.4 INSTALLATION OF WOVEN WIRE FENCE

A. Space line posts no more than 16.5 feet center to center. Space line posts adjacent to any end, corner, gate, or intermediate braced post no more than 10 feet, center-to-center.

B. Set posts in holes with a minimum depth of 4.5 feet, allowing a tolerance of ± 3 inches, provided the exposed portion of the post is not less than 4.3 feet. Set posts with the large end down, plumb on the side to receive fabric.

C. Install angle posts where a deflection in fence alignment exceeds 30 degrees. Install intersection posts at the line of intersecting fencing runs. Connect intersecting runs of fence to a common post.

D. Drive metal posts with a suitable driver acceptable to the Landscape Architect. Ensure metal posts are driven to the proper depth, plumb, and in conformity with the fence lines indicated on the Plans. Remove and replace any metal posts bent or damaged during driving.

E. Set end, corner, gate, angle, intersection, and intermediate braced posts in concrete with a minimum diameter and depth of 18 inches.

1. Set braces in concrete with a minimum diameter and depth of 18 inches.

2. Brace corner, angle, and intermediate braced posts in both directions. Brace intersection posts in three (3) directions.

3. Securely fasten braces to the post near the top.
4. Set line posts in concrete at least 18 inches in diameter and 4.5 feet deep at all grade depressions and alignment angles.

F. Install woven wire fabric to the lines and levels indicated on the Plans. Stretch fabric taut and securely fasten it to each post, with the bottom approximately 2 inches above the ground. Wrap each horizontal strand of wire completely around the end, corner, gate, intermediate braced, or angle post, and securely fasten by winding the end about the wire leading to the post. Do not use line posts as stretching anchorages.

G. Splice wire in woven wire fabric and barbed wire in a manner that develops the full strength of the wire. Ensure the distance between vertical stays adjacent to the splice matches that of the unspliced sections of the fabric. Place one (1) approved splice at the end of the roll of fence without regard to the distance from a post.

H. Securely fasten fabric to each metal post with at least six (6) wire clamps.

I. Attach fabric to each wood post with at least one (1) fastener for each horizontal strand and as many additional fasteners as required to secure the wire firmly to the post.

J. Top fabric with barbed wire as indicated on the Plans. Securely fasten barbed wire to each post.

K. Erect gates using methods acceptable to the Landscape Architect in the locations shown on the Plans.

3.5 INSTALLATION OF CHAIN LINK FENCE

A. Set and brace posts for chain link fence as indicated on the Plans, as specified herein, or if not indicated, ensure installation meets the requirements of ASTM F567 and CLFMI CLF 2445.

B. Space line posts no more than ten 10 feet center-to-center. Install angle posts where a deflection of ten (10) degrees or more occurs in the fence alignment.

C. Space intermediate, braced posts at 660 foot intervals or midway between end posts, angle posts, or corner posts when the distance is less than 1,320 feet but more than 660 foot.

D. Set intersection (corner) posts in line with intersecting fences. Connect both intersecting fences to the common post.

E. Set posts in concrete. Ensure the depth of concrete footings for line posts is no less than 3.5 feet.

1. Ensure footing diameters are no less than 9 inches for line posts.
2. Set footing diameters for end, corner, angle, intersection, gate, and intermediate braced posts at 18 inches.
3. Fill holes for post foundations completely with concrete around the post.

F. Ensure all fences have at least a top rail and a bottom tension wire.

1. Install center and bottom rails on fences 10 feet or more in height, and where otherwise indicated on the plans. Securely connect bottom and center rails to posts using connections approved by the Landscape Architect.

G. Pass the top rail through the line post tops to form a continuous brace from end to end of each stretch of fence fabric. Provide splice joints as indicated on the Plan. Use suitable ties or clips to attach the fabric securely to the top rail at intervals not exceeding 24 inches.

H. Secure the top, center, and bottom rails to gate, corner, pull, end, and line posts as indicated on the Plans.

I. Secure horizontal braces of fencing 6 feet high and over to all end, corner, angle, intersection, gate, and intermediate braced posts using suitable metal connections. Position braces midway between the top rail and ground, extending to the first line posts. Truss braces as indicated on the Plans.

J. Fit posts with post tops.

K. Install chain link fabric to the height indicated on the plans. Pull fabric taut and tie it to posts, rails, and tension wires. Secure fabric to framing using suitable metal bands, hogs, or clips. Space fasteners no more than 12 inches apart on posts and no more than 15 inches apart on the top rail.

1. Space hog rings for connecting fabric to tension wire no more than 24 inches apart.

L. Install extension arms as indicated on the Plans. Ensure intermediate extension arms have a hole for passage of the top rail. Position the extension arm to carry three (3) barbed wires, equally spaced, with the topmost barbed wire approximately 12 inches in or out from the fence line.

M. Provide one (1) stretcher bar for each gate and end post, and two (2) stretcher bars for each center and pull post. Thread bars through fabric and secure them to posts with metal bands spaced no more than 15 inches apart.

N. Fasten tie wires where shown and as required. Use U-shaped clips of wire securely fastened around pipe for clasping pipe and fabric. Bend ends of tie wire to minimize hazard to personnel and clothing.

O. Gates

1. Install gates of types and sizes and in locations indicated on the Plans.

2. Install ground-set items in concrete for anchorage as recommended by the manufacturer of the chain link fence.

3. Place the lower hinge of the gate on top of the concrete footing in which the gate post is set. Ensure the footing concrete extends up to the bottom of the lower hinge.

4. Set cone bolt sockets for double swing gates in concrete so that the plunger pin fits in the socket when the gate is in the closed position.

5. Erect gates to swing in the direction indicated. Install gate stops to limit the swing as shown on the Plans.

6. Hang gates plumb, level, and secure, ensuring full opening without interference.

P. Use privacy slats of the types and sizes indicated on the Plans. Secure slats to the fabric using suitable clinch-lock type fasteners acceptable to the Landscape Architect. Attach slats to the fabric with suitable metal fasteners on 6 inch vertical centers.

3.6 ADJUSTMENT

A. After erection of fences, adjust all gate hardware for smooth and positive operation.

3.7 POST LEVELING

A. Cut off the tops of wood posts to the proper elevation after erecting the fences.

3.8 LUBRICATION

A. After completion of fence erection, lubricate moving parts of gate hardware to ensure smooth operation without binding.

3.9 TABLES

A. Table A - Dimensions and Weight of Gate Posts:

Gate Leaf Width	Outside Dimension	Minimum Weight
For Fabric Height 6 foot or less		
4 feet or less - round	2.375 inch	3.65 lbs per ft
4 feet or less - square	2 inch	2.6 lbs per ft
4 - 10 feet - round	2.875 inch	5.79 lbs per ft
4 - 10 feet - square	2.50 inch	5.10 lbs per ft
10 - 18 feet - round	4.0 inch	8.65 lbs per ft
10 - 18 feet - square	2.50 inch	5.10 lbs per ft
For Fabric Heights over 6 foot		
6 feet or less - round	2.875 inch	5.79 lbs per ft
6 feet or less - square	2.50 inch	5.10 lbs per ft
6 - 12 feet - round	4.0 inch	8.65 lbs per ft
6 - 12 feet - square	2.50 inch	5.10 lbs per ft
12 - 18 feet - round	6.625 inch	18.02 lbs per ft
Over 18 feet - round	8.625 inch	27.12 lbs per ft

B. Table B - Gate Frame Members, Dimensions and Weights:

Gate Frame Material	Outside Dimension	Minimum Weight
For Fabric Heights 6 foot or less		
Round Tubular Steel	1.66 inch	1.83 lbs per ft
Rectangular Tubular Steel	1.5 inch	1.84 lbs per ft
For Fabric Heights over 6 foot		
Round Tubular Steel	1.9 inch	2.28 lbs per ft
Rectangular Tubular Steel	2.0 inch	2.52 lbs per ft
Interior Bracing		
Round Tubular Steel	1.66 inch	1.83 lbs per ft

Rectangular Tubular Steel	1.5 inch	1.84 lbs per ft

END OF SECTION

SECTION 32 90 00
PLANTINGS

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section includes furnishing trees, shrubs and ground cover as shown on the Plans, complete with the digging and preparation of holes, furnishing and placing of topsoil, planting, pruning, watering, fertilizing and cultivating; weed control fabric, and such other materials necessary to complete the Work and insure proper and hardy growth.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 89 00 - Site Construction Performance Requirements

1.3 SOURCE QUALITY CONTROL

A. Ensure trees, shrubs, and ground cover comply with state and federal laws regarding inspection for plant diseases and insect infestation.

1.4 REFERENCE STANDARDS

A. AAN - American Association of Nurserymen

B. AANLS - American Association of Nurserymen Landscape Standards

C. ANSI - American National Standards Institute

D. ASTM C33/C33M: Standard Specification for Concrete Aggregates

E. ASTM D4491/D4491M: Standard Test Methods for Water Permeability of Geotextiles by Permittivity

F. ASTM D4533/D4533M: Standard Test Method for Trapezoid Tearing Strength of Geotextiles

G. ASTM D4632/D4632M: Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

H. ASTM D4751: Standard Test Methods for Determining Apparent Opening Size of a Geotextile

I. ASTM D4833/D4833M: Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

J. ASTM D5261: Standard Test Method for Measuring Mass per Unit Area of Geotextiles

K. MDOT - Michigan Department of Transportation Standard Specifications for Construction, latest edition

1.5 SUBMITTALS

A. Submit certificates of inspection for plant diseases and insect infestation to the Landscape Architect.

B. Submit a certified analysis of imported topsoil from each off-site source prior to delivery. Correct deficiencies at the Contractor's expense.

C. Submit sample of mulch and planting mixture prior to delivery to site.

D. Submit product data for anti-desiccants, tree wound dressing and herbicides prior to use.

1.6 PLANT SELECTION AND INSPECTION

A. Inspect and accept all trees prior to planting. Elect either of the following options, as applicable:

B. For sources within 120 miles of the site, the Landscape Architect will tag the trees at the source. Request, in writing, at least two (2) weeks prior to any desired inspection date, inspection and approval of the trees at the source. The Landscape Architect will tag approved trees, and the tag must remain on the tree until planting and final inspection. Accompany the Landscape Architect during the inspection.

1. Deliver the trees to the site. Tag approved trees with the Landscape Architect's approval, and ensure the tag remains on the tree until planting and final inspection. Remove rejected trees immediately from the site and bring in new trees for inspection and approval.

C. Subject plant material to approval by the Landscape Architect at the site prior to planting.

1.7 PREPARATION OF SHIPMENTS

A. Label plant material clearly with species and variety. Securely attach the label or tag to each plant, displaying the scientific name. Unless otherwise shown on the Plans, ensure all plants are balled and burlapped or container-grown.

B. Complete all balling operations for balled and burlapped stock before "bud break" in preparation for spring planting. For fall planting of deciduous plants, begin balling operations only after the plants have started to "harden off."

C. Dig and pack stock with care immediately prior to shipment. Ensure plants are dug and transported to provide and retain a firm ball of earth.

D. Protect the roots carefully with wet straw, moss, or other material. Adequately shield the root balls from rain or sudden weather changes. Reject balled and burlapped plants if the balls of earth are loosened or broken, or if wrapped in synthetic or plastic material.

E. Ensure container plants have well-established roots in the soil mass and have grown in the container for at least one (1) growing season. Use containers large enough to provide an earth-root mass of adequate diameter and depth for the stem diameter and plant height or spread, as established by accepted nursery practice. Reject container-grown stock if it is root-bound.

F. Transport all nursery stock in an enclosed or covered vehicle. Deliver plant material immediately prior to planting and keep it moist.

G. Plants will be rejected when the ball of earth surrounding the roots has been cracked or broken prior to or during the planting.

H. Reject plants if the burlap, stakes, or ropes required for transplanting are displaced prior to final acceptance.

1.8 STORAGE AND HANDLING

A. Keep the roots of plants moist and adequately protected with topsoil or another approved covering until planting.

B. Protect the trunks and branches of trees from injury during digging, loading, transporting, and planting. Reject trees that are injured.

1.9 PLANTING SEASON

A. Plant deciduous plants between March 1 and June 1, and from October 1 until the ground becomes freezes, unless unusual planting conditions exist or container-grown material is used, in which case the planting seasons may be altered.

1. When approved by the Landscape Architect, plants, having a ball of earth attached, may be planted during the summer months, provided adequate moisture will and can be applied to the plants.

B. Plant evergreen plants between March 1 and June 1.

1.10 GUARANTEE AND ACCEPTANCE

A. Warrant that all trees have been grown, transported, handled, and planted properly to ensure they are in a vigorous growing condition at the start of the establishment period.

B. Guarantee trees, shrubs, and ground cover for the establishment period(s). Replace any trees, shrubs, or ground cover showing defective growth, more than 20% dieback, disease, insect infestation, or other impairing defects with sound, healthy, vigorous plants at no additional expense to the Owner, in accordance with the plans and specifications.

C. Request final acceptance at the end of the Establishment Period. The Landscape Architect and Owner will make final acceptance, provided the trees are healthy and all project requirements have been fulfilled.

1.11 EXPERIENCE AND QUALIFICATIONS

A. Ensure concrete conforms to MDOT Section 1004, using 3500 psi strength concrete; Type IA cement; MDOT 6A coarse aggregate; MDOT 2NS fine aggregate; 3 inch maximum slump; no admixtures without the Landscape Architect's approval.

B. Ensure the Contractor or Subcontractor must be experienced and capable of completing the Work so that the plant materials are in a healthy, vigorous growing condition at the end of the Project. In order to show that the Contractor or Subcontractor is capable of completing the Work successfully, when requested by the Landscape Architect, submit references from the last five (5) projects of a similar nature. Failure to show successful completion of the last five projects of a similar nature may result in the Contractor or Subcontractor being deemed unacceptable for this Work on this Project.

PART 2 PRODUCTS

2.1 TREES AND SHRUBS

A. Ensure all trees and shrubs conform to the requirements of AANLS and as specified herein.

B. Ensure plant material conforms to the sizes specified in the plant list or Proposal. All measurements, such as spread, ball size, number of canes, and quality designations, must comply with AAN “American Standard for Nursery Stock”.

C. Ensure plant material is typical for their species or variety, sound, healthy, vigorous, and free from plant diseases, insect pests, or their eggs. Ensure they have healthy, well-developed root systems.

D. Ball and burlap plants designated “B&B” must be dug with firm, natural balls of earth, sufficient in diameter and depth to encompass the fibrous and feeding root system for full recovery. Securely wrap balls with burlap and bind with cord. Reject any balled and burlapped plant if the ball is cracked or broken. Do not allow planting with rot-proof burlap or ties. Reject sand balls.

E. Ensure trees are nursery-grown stock, pruned to encourage single main stems, compact fibrous root systems, and symmetrical branching. Ensure uniform height and spread for trees of the same species. Keep all trees free from insects, diseases, mechanical injuries, or other objectionable features. Ensure root balls match the sizes specified in AANLS for the tree root system.

F. Ensure container-grown stock has been grown in containers for a minimum of one (1) growing season. Reject plants showing "Pot Bound" root ends.

G. Determine the caliper of trees less than 4 inch caliper at a point 6 inch above the ground when installed. Measure trees above 4 inch caliper at a point 12 inch above the ground.

H. Ensure ornamental trees and shrubs are well-formed with a crown typical of the species or variety. Provide low-branched crown types unless the Plans or Proposal specify a tree form or bush form. Ball and burlap material unless otherwise indicated.

I. Ensure plant stock has grown to the required size in a normal, progressive manner. Do not permit heading-back plants to meet the sizes called for on the Plans.

J. Provide ball and burlap or other adequate root protection for evergreen trees. Ensure tops are of a form typical to the species, not unnaturally sheared or color-treated. Apply anti-desiccant protection as needed for evergreen trees.

K. Ensure plant material is nursery-grown at sources in the same or higher hardiness zone, as determined by the latest edition of the Plant Hardiness Zone Map, Agricultural Research Service, U.S. Department of Agriculture.

L. Substitutions will be permitted only upon submission of proof that specified plants are not obtainable and with the authorization of the Landscape Architect. Requests for substitutions and price adjustments due to substitutions must be submitted in accordance with the General Conditions.

2.2 MULCHING

A. Use mulching material as specified on the plans, selecting from one of the following options.

1. Compost:
    a. Use mature/stabilized, humus-like compost derived from the aerobic decomposition of yard waste (e.g., grass clippings and leaves) or other designated compostable materials as defined in MCLA PA 641 as amended. Ensure compliance with all federal and state laws.
    b. Ensure compost has a dark brown or black color, supports plant growth without the need for ongoing fertilizers or soil amendments, and has no objectionable odor. Ensure the mixture is free of glass, plastic, metal, and other contaminants, as well as viable weed seeds and plant parts capable of reproducing. Handle the mixture in a way that produces no visible water or dust.
    c. The manufacturer of the compost must provide test data and a statement to confirm that the following criteria are met by the compost provided for the project. The composition of the compost must fall within the following range of values:

Quality Parameter	Range of Value
Soil pH	6 to 7.5
Soluble Salts	2 to 5 mmho/cm
Carbon/Nitrogen Ratio	13 to 20 parts C to 1 part N
Inerts	< 1%
Organic matter	35 to 55 %
Nitrogen	1 to 2 %
Phosphorus	0.2 to 0.8 %
Potassium	0.5 to 1.5 %
Unit Weight	535 to 775 kg per cubic meter
Moisture Content	40 to 50 %
Particle Size	< 20 mm maximum
Water Holding Capacity	> 100%
Heavy Metals	None

    d. Maturity/Stabilization: An acceptable test that can demonstrate Maturity/Stability.
    e. Temperature: Compost material must have undergone the procedure to significantly reduce the pathogen level as referenced in EPA 40 CFR, Part 257 Regulations, Federal Register Vol. 58, No. 32, dated 2/19/93; Rules and Regulations. The temperature must be maintained at 104 degrees F for 5 days with a temperature exceeding 130 degrees F for at least 4 hours.
    f. Pathogens and Trace Elements: Meet the requirements of EPA 40 CFR; Part 503 Regulations, Federal Register Vol. 58, No. 32, dated 2/19/93; Rules and Regulations.
    g. To comply with the annual filing requirements with the Michigan Department of Agriculture, Pesticide and Plant Management Division, the supplier of the

compost must certify that the compost meets Michigan P.A. 641, as amended, and EPA 40 CFR, Part 257 and 503 Regulations, Federal Register Vol. 58, No. 32; dated 2/19/93; Rules and Regulations.

1) Accompany the certification with a data sheet. Display the following on the data sheet:

a) Standard compost total nutrient test results, including N, P, K, Ca, Mg, Mn, Cu, Fe total carbon, pH, as provided by an acceptable testing laboratory

b) Organic content

c) Inert contamination

d) Soluble salts

e) Carbon/Nitrogen ratio

f) Proof of maturity/stability acceptable to the Michigan Department of Agriculture

2. Wood Chips:

a. Ensure wood chips are the product of a mechanical chipper. Exclude twigs, chopped leaves, and pine needles from the chips. Determine the suitability of chip material and size through visual inspection by the Landscape Architect. Produce wood chips from trees free of insects and diseases.

3. Shredded Bark:

a. Ensure shredded bark consists of tree bark stripped and shredded from saw logs using a debarking machine. Produce shredded bark from trees free of insects and diseases. Make the material sufficiently fine and free from extraneous material to pass through a conventional mulch blower.

4. Double Shredded Bark:

a. Process shredded bark mulch twice to create double-processed shredded bark mulch.

2.3 TOPSOIL

A. Ensure topsoil is fertile, friable, sandy clay loam without admixture of subsoil. Keep topsoil free of glass, stones larger than one inch in any dimension, weeds, undesirable grasses, and other extraneous materials. Maintain the following range of values for topsoil:

1. pH 5.0 to 7.5
2. Soluble Salts 500 ppm max
3. Organic Content 5% to 30%
4. Silt Content 35% to 50%
5. Clay Content 5% to 10%

6. Deleterious Mat'l* 5% max *rock, gravel, stone, sticks, roots, sod, etc.

B. Compost may be mixed with topsoil to obtain the desired content. Topsoil is to be final screened thru a 5/8 inch maximum mesh screen prior to delivery to the Project site.

1. Have the Landscape Architect review source and final screen results prior to releasing topsoil. Submit a certified analysis of the topsoil from each source to the Landscape Architect.

2. Place topsoil in a minimum thickness of 4 inch (100 mm) throughout, or as specified in the plans or Specifications.

C. Obtain a topsoil borrow pit source and secure necessary permits and agreements for the use of such borrow pits at own expense.

2.4 SAND

A. Use clean, coarse, ungraded sand for planting mixture that conforms to ASTM C33/C33M for fine aggregates.

2.5 FERTILIZER

A. Use Agriform 21-Gram Planting Tablets Plus Minors or Landscape Architect approved equal for fertilizer. Ensure planting tablets are tightly compressed, long-lasting, and slow-release with an N-P-K analysis of 20-10-5. Apply according to manufacturer's recommendations and soil analysis.

2.6 PEAT

A. Use granulated raw Canadian peat or baled Canadian peat containing no more than 9% mineral on a dry basis. For ericaceous plants, use baled peat with a pH of 4.0.

2.7 LANDSCAPE WEED CONTROL FABRIC

A. Ensure weed barrier fabric consists of a geotextile fabric, spun-bonded polypropylene, non-woven fabric, and a UV stabilizer.

B. Ensure the fabric meets the following Minimum Average Roll Values:

Fabric Properties	Minimum Values	Test Method
Unit Weight	3.0 oz/yd2	ASTM D5261
Grab Tensile Strength	135 lbs.	ASTM D4632/D4632M
Elongation at Break	70%	ASTM D4632/D4632M
Puncture Strength	35 lbs.	ASTM D4833/D4833M
Trapezoidal Tear	50 lbs.	ASTM D4533/D4533M
Permittivity	1.2 $sec.^{-1}$	ASTM D4491/D4491M
Apparent Opening Size (equivalent Sieve)	60/70	ASTM D4751
Ultraviolet Stability	70% @ 500 hrs.	ASTM D4355/D4355M

2.8 STEEL LANDSCAPE EDGING

A. Comply with ASTM A36/A36M or ASTM A283/A283M, hot-rolled, standard flexible carbon steel landscape edging, fabricated in sections with stake pockets stamped, punched, or welded to face of sections approximately 30 inches apart to receive stakes. Double stake steel landscape edging at overlap joints, and design it to receive tapered steel stakes.

B. Ensure steel edge is 12ga steel, 4 inches wide, by 10 foot length, with 4 stakes. Apply a Sherwin Williams H68GT85 powder coat paint electrostatically and oven-bake it to a minimum thickness of 1.5 mils. Use green, brown, or black color as determined by the Owner.

C. Ensure steel stakes are tapered, 14 inches long, and finished to match the specified steel landscape edging. Design stakes specifically to anchor steel landscape edging in place and manufacture them by the same company that produces the steel landscape edging.

D. Furnish and install manufacturer's standard start/end sections, 90 degree corners, and splicers as required.

2.9 STAKES FOR GUYING AND BRACING

A. Use sound wood stakes of nominal 2 x 2 inch stock, approximately 30 inches in length for guying or of the required length for bracing. Point one end of the stakes by beveling on two (2) sides.

B. Use green metal T-section posts for bracing trees, without anchor plates. Ensure posts are at least 8 foot long and use them only where specified on the plans.

2.10 WIRE FOR GUYING AND BRACING

A. Ensure wire is new and free from bends or kinks.

B. Use No. 11 steel wire for guying trees 4 inches or less in diameter.

C. Use No. 9 galvanized steel wire for guying trees over 4 inches in diameter.

2.11 HOSE

A. Use new 1/2 inch reinforced rubber garden hose or steam hose with wire for guying trees.

2.12 PLASTIC GUYING AND BRACING MATERIAL

A. High density polyethylene, chain-lock type material, 1 inch wide with a breaking strength of 100 lbs minimum.

B. Flat, woven, webbing type 3/4 inch wide tape constructed of polypropylene with a breaking strength of 900 lbs in either white or olive green.

2.13 TREE BALLING BURLAP

A. Use untreated burlap or other material that will readily decompose for balling. Do not permit synthetic materials like nylon or plastic.

2.14 PLANTING MIXTURE

A. Mix 1/3 topsoil, 1/3 sand, and 1/3 peat for the planting mixture. Add fertilizer in the quantity recommended by the manufacturer. Ensure the planting mixture is free from sticks, stones, sod, clods, or other material that might leave pockets around the roots.

2.15 BIORETENTION PLANTING MIXTURE

A. Ensure bioretention planting mixture has a sandy loam, loamy sand, or loam texture per the USDA textural triangle. Limit clay content to a maximum of 5%.

B. Ensure the soil mixture has a pH between 5.5 and 6.5 and an organic content of 1.5 – 3.0%.

C. Ensure the soil mixture has an infiltration rate greater than 0.5 inches/hr.

D. Ensure the soil is a uniform mix, free of stones, glass, trumps, roots, or other similar objects larger than 1 inch.

E. Ensure no other material or substances are mixed or dumped with the bioretention mix that could harm plant growth or hinder planting or maintenance operations.

F. Ensure the planting mixture is free of Bermuda Grass, Quack grass, Johnson Grass, Mugwort, Nutsedge, Poison Ivy, Canadian Thistle, Tearhub, or other noxious weeds.

2.16 ACCEPTABLE MANUFACTURERS

A. Use Adj-A-Tye heavy duty poly chain lock by A. M. Leonard Inc., ArborTape by Neptco Inc., or Landscape Architect approved equal.

PART 3 EXECUTION

3.1 CONTRACTOR'S VERIFICATION

A. Stake all plant locations and confirm the locations and types of plants with the Landscape Architect. Inspect trees, shrubs, and ground cover for injury, insect infestation, and improper pruning. Verify that all trees, shrubs, and ground cover are in healthy growing condition.

3.2 PREPARATION

A. Do not begin excavation until the stakeout of tree and/or shrub locations is acceptable to the Landscape Architect.

B. Stake enough planting locations for two weeks of work. Arrange periodic site meetings with the Landscape Architect to review the work completed in the prior two weeks and the staking for the next two weeks. Notify the Landscape Architect at least three (3) working days prior to the desired date for inspection of staking.

C. Accurately stake plant material locations according to the plans. Stake trees 36” high above finished grade and paint them a bright color to ensure clear visibility for inspection. Use different colors to distinguish between types of material, e.g., evergreen trees, canopy trees, flowering trees. Stake shrubs, perennials, and ground covers 18 inches high above finished grade and paint them white. Place stakes at the perimeter and at the bed line 30 feet on center. Have the Landscape Architect review the locations and make changes as necessary.

3.3 PLANTING

A. Set balled and burlapped plants plumb. Excavate tree pits as shown on the plans. Dispose of subsoil dug from pits, trenches, and beds.

B. Plant to correct grades and alignment. Set all plants so that, when settled, they bear the same relation to finish grade as before being transplanted. Do not permit any filling around trunks or stems.

C. Excavate tree pits and beds at the start of the Work. Request inspection and approval by the Landscape Architect. Obtain approval before backfilling occurs.

D. Set the root ball on a compacted base as detailed. Cut away burlap from the top 1/3 of the root ball and remove all ropes, wires, and other materials securing the ball.

E. Completely remove plastic tape and/or plastic fabric from the root ball during the planting operation. Also, remove all "rot proof" or treated burlap.

F. Plant container-grown plants as specified for balled and burlapped stock. For non-plantable containers, remove the container only at planting time. For plantable type containers, sever the container sides in multiple places and remove the upper half during the planting operation. Protect tree roots during the severing and removal process.

G. Once the plant is properly set, backfill the pit with planting mixture, gradually filling, tamping, and settling with water. Do not use frozen or muddy soil for backfilling. Place the backfill to an elevation flush with the ground and the rootball, creating a saucer near the edge of the hole to capture water.

H. Apply Landscape Architect-approved superphosphate fertilizer over the planting mixture during fall planting, following the manufacturer’s instructions for the rate.

I. Spray all evergreen plant material with Landscape Architect-approved anti-desiccant immediately following planting and during final seasonal watering, according to the manufacturer’s instructions and limitations.

3.4 MULCHING

A. Place mulching material over the plant hole area to a depth of 5 - 6 inches or as specified on the plans after backfilling. Thoroughly soak all mulched areas. After watering, rake all mulched areas and leave them in a complete and finished manner.

B. Apply 3 inches of mulch to perennial areas or as specified on the plans. Mulch these areas first, then plant ground cover through the mulch.

C. Mulch planting beds with a 4 inches cover as shown on the drawings and details, unless otherwise indicated. Ensure mulch depths are 4 inches at the time of inspection.

D. Construct an earth saucer or berm halfway around each plant on the down slope side for plants located on slopes. Ensure the saucer or berm has an inside diameter equal to the planting hole and a maximum height of 6 inches. Dig a trench on the down slope side and fill it with planting mixture to allow for drainage.

3.5 BRACING AND GUYING

A. Only evergreen trees equal to or larger than 5 feet high and deciduous trees with a caliper equal to or larger than 2 inches need to be staked or guyed unless clay soil

conditions exist, a tree is planted on a steep slope, or otherwise becomes apparent that a tree needs to be braced or guyed.

1. Brace or guy trees immediately after planting if required.
2. Brace all plants requiring support with a minimum of two (2) stakes. Drive stakes to avoid the ball and place them no closer than 1 foot (300 mm) from the trunk.
3. Drive stakes to a depth that firmly anchors the plant, but no less than 1 foot below the bottom of the planting hole. Position the wide side of the stake facing the trunk of the plant.
4. Extend stakes to within 4 inches of the lowest plant's main branches. Firmly attach the top of the stake to the trunk using steel wire or plastic guying and bracing material.
5. When using steel wire, place it to form a figure eight (8) around the stake and trunk. Encase portions of the wire around the trunk in water hose of sufficient length to contain the wire loop. Ensure the enclosed trunk loops do not restrict normal trunk growth.
6. Position stakes on opposite sides of the trunks and secure them to the trunk at approximately 2/3 of the plant's height. Tie warning tape or ribbon to the wiring between the tree and the stake.

3.6 PRUNING

A. Prune new plants as determined by the Landscape Architect. Ensure all pruning is done by workmen experienced in this type of work and is completed prior to planting. Do not permit the use of hedge shears for pruning. Perform pruning in accordance with the best standard practices.

B. Prune deciduous trees to balance the loss of roots while retaining the natural form of the tree type.

C. Prune evergreen trees only to remove broken or damaged branches.

D. Make cuts flush, leaving no stubs. Paint all cuts over 3/4 inch in diameter with tree paint.

E. Notify the Landscape Architect at least one (1) week prior to pruning operations.

3.7 WATERING, FERTILIZING AND CULTIVATING

A. Thoroughly soak all plants after planting. After watering, rake all beds and leave them in a complete and finished manner.

B. Water, fertilize, and cultivate during the Establishment Period. Include all necessary measures to establish and maintain plants in a vigorous and healthy growing condition throughout the entire Establishment Period.

C. Manually water the plants a minimum of once a week or as necessary to keep them thriving from May 15 until October 15, or for the duration of the Establishment Period.

D. If the planted areas have an automatic irrigation system that the Contractor is relying upon, it is the responsibility of the Contractor to ensure that the irrigation system is functioning properly.

   1. Notify the Landscape Architect or the Owner immediately if the Contractor concludes that the irrigation system is not working properly, so it can be fixed in a timely manner.

   2. However, the Contractor will have to manually water the plants as necessary to keep them in a thriving condition at all times that the irrigation system is not working properly.

E. Keep planting beds and tree saucers free from weeds to the satisfaction of the Owner. Treat mulch with pre-emergent weed killer.

F. Keep trees erect. Raise trees that settle below grade to the established elevation. Keep tree wrap and wire in neat condition. Prune dead or broken branches from all trees and shrubs. Fill to the original grade level areas that have settled around trees and shrubs.

G. Provide winter protection by spraying all evergreen trees and shrubs with an anti-desiccant emulsion type agent in late fall, at the manufacturer's recommended rate, to prevent winter desiccation. Also, perform late fall watering if required by a dry season.

H. At the season's first watering, apply an Landscape Architect -approved organic timed-release, balanced fertilizer to the ground around the tree at the rate instructed by the manufacturer. Alternatively, use pre-packaged, controlled-release fertilizer packets. Apply one (1) 2 oz packet of fertilizer for every 1 inch caliper of tree, or one (1) 2 oz packet for every shrub.

I. During the first and second waterings of the growing season, apply a nitrogen-enriched solution containing available nitrogen at a rate of 8.5 lbs/1000 gallons of water (42 pounds of 20-0-0, or 18 pounds of 45-0-0, fertilizer per 1,000 gallons of water). Do not apply any fertilizer after July 7.

J. During the establishment period(s) outlined in the Contract Documents, perform all required watering, cultivating, pruning, fertilizing, weeding, and other necessary work to keep the planted material vigorously growing, sound, and healthy. Repair or replace any guying or bracing that is damaged, destroyed, or broken. Spray any plant material that becomes diseased or infested with insects.

K. Repair or replace any trees that are blown over, knocked down, uprooted, or otherwise become impaired or defective.

L. Replace any plant material that is not in good physical condition, has more than 20% die back, shows defective growth, disease, signs of insect infestation, or any other impairing defects during the Establishment Periods.

M. Repair or replace any plant material damaged or impaired by wind, rain, snow, ice, sleet, sun, heat, drought, or any other weather-related occurrences.

N. Include the costs for all labor, material, and equipment necessary to carry out the provisions of this Article in the Contractor's bid price for planting trees, unless

otherwise indicated in the Proposal. Notify the Landscape Architect prior to beginning any work called for under this Article.

O. Remove and dispose of the guying material, wrapping material, identification tags, and inspection tags off the project at the end of the Establishment Period, unless otherwise determined by the Landscape Architect. Replenish the mulch around all the plants to the required depth of 5 - 6 inches.

3.8 ESTABLISHMENT PERIOD

A. Begin the Establishment Period on the day of written acceptance of the installation of the trees, shrubs, bulbs, ground cover, or other plant material. Start each subsequent establishment period on the same day of the succeeding year(s). Ensure the Establishment Period lasts a minimum of one year unless otherwise indicated in the Contract Documents.

3.9 SCHEDULES

A. Follow the general planting location, type, and size of tree or shrub as indicated on the Plans. Obtain approval from the Landscape Architect for any substitutions of plant material or alterations in plant sizes or specifications prior to ordering.

3.10 STEEL LANDSCAPE EDGING

A. Install steel landscape edging where indicated on the Drawings, following the manufacturer’s recommendations. Anchor with steel stakes spaced approximately 30 inches on-center, driven below the top elevation of the edging, or at every stake pocket location in landscape edging sections designed to receive stakes. Position stakes in solid, undisturbed soil, or in soil compacted to 85% of its maximum density.

B. Install straight sections true to the alignments as indicated, free of waves or bends, using strings as guides. Install curved sections true to the alignments as indicated, free of waves or bends, following marked alignments approved in the field by the Landscape Architect. Provide the Landscape Architect with the opportunity to review the layouts.

C. Set top of edging flush with finish grade. Set top of stake 1/2 inch below top of edging.

D. Replace edging sections damaged by construction operations.

END OF SECTION

SECTION 32 92 19
SEEDING

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section includes seeding complete with earth bed preparation, providing and placing topsoil, preparation and fertilizing topsoil, sowing of seed for lawns and other ground cover, protection of seeded areas, watering of seeded areas, mowing of seeded areas, protection and cleanup.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 33 00 - Submittal Procedures

C. Section 01 89 00 - Site Construction Performance Requirements

D. Section 31 22 00 - Grading

E. Section 32 92 23 - Sodding

1.3 REQUIREMENTS OF REGULATORY AGENCIES

A. Comply with the applicable requirements of the Michigan Seed Law, Act 329, PA of 1965, as amended.

B. Comply with the applicable requirements of the AOSA Rules for Testing Seeds.

C. Supply chemical fertilizer in suitable bags with the net weight of the contents and guaranteed analysis shown on the container. Accompany bulk shipments with an analysis and net weight certification of the shipment.

1. Accompany custom mixed fertilizers with a certification of the weight of each commercial fertilizer used in the mixture and a guaranteed analysis of each shipment, expressed in percentages of total Nitrogen (N), total available Phosphoric Acid (P2O5), and total available Potash (K2O).

1.4 SOURCE QUALITY CONTROL

A. Test the seed mixture for purity and germination by the Seed Producer within nine (9) months of sowing.

1.5 REFERENCE STANDARDS

1. AOSA RULES - Association of Official Seed Analysts

2. ASTM C602: Standard Specification for Agricultural Liming Materials

3. ASTM D977: Standard Specification for Emulsified Asphalt

4. MDOT - Michigan Department of Transportation, Standard Specifications for Construction, latest edition

1.6 SUBMITTALS

A. Submit Seed Producers Certification that seed meets the requirements of these Specifications and conform to the State of Michigan Seed Act referenced above.

B. Where required, submit test reports for all seed proposed for use in the Work to the Landscape Architect, showing results of purity and germination tests, compliance with regulatory agencies, dates and location of tests.

C. Perform soil tests -1 per designated area - to confirm the fertilizer and lime necessary for the site. Limit the amount of fertilizer and lime to what is absolutely necessary to ensure optimal growth.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project site in their original, unopened containers. Mark containers clearly with the name of the manufacturer, brand name, trade name or generic name of material, warranty of analysis, net weight of contents, and date of packaging, where applicable.

B. Deliver seed to the site in durable bags, tagged or labeled with the date of tests, warranty of purity and germination analysis, name, lot number, and net weight of contents.

C. Deliver commercial fertilizers to the site of the Work in original unopened bags. Ensure bags do not exceed 100 lbs net weight each and are clearly marked with guaranteed analysis in a conspicuous location on each bag.

D. Store material at the Project site, under shelter, off the ground, and protect it from damage by moisture, temperature, exposure to elements, vandalism, or any other action that might impair its use.

E. Handle materials proposed for use in the Work in a manner that protects both the material and the personnel involved. Handle seed to protect the mixture from contamination or deterioration.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Seeding is limited to the periods between April 20 and June 1, and August 10 to October 10 and after for as long as weather permits preparation of the seed bed without irrigation and the ground is not frozen. With the use of irrigation and/or mulch, seeding can be done from April 20 thru October 1 inclusively.

B. Comply with the limitations placed on the use of certain soil protection materials because of prevailing temperatures as described in this Section.

C. Comply with the limitation placed on seeding applications because of wind velocity as described in this Section.

1.9 PROTECTION

A. Provide suitably approved warning signs and barricades for protection of seeded areas from pedestrian or vehicular traffic. Protect newly seeded areas during the progress of the Work and until completion of the turf establishment period.

B. Protect adjacent construction from topsoil spills and perform such cleanup of affected surfaces before it becomes compacted by traffic.

1.10 FINAL ACCEPTANCE

A. Establish a dense cover of seeded grass on all disturbed areas and maintain these areas until final acceptance of the Work by the Landscape Architect. The Landscape Architect will inspect the turf to ensure the grass seed is well established, weed-free, and in a growing, vigorous condition. Re-seed areas that do not meet the Landscape Architect's approval at the Contractor's expense.

PART 2 PRODUCTS

2.1 SEED

A. Use certified, mature, clean, dry, new crop seed products suitable for the specified applications. Ensure seed and seeding mixtures have the percentages of purity, germination, and proportions, by weight, as indicated in Table 1.

Table 1 - Seeding Mixtures

Kind	Seeds		Mixture Proportions (%)			
	Purity	Germination	TDS	TUF	TGM	THM
Kentucky Blue Grass	98%	80%	5	10	10	30
Perennial Rye Grass	96%	85%	25	20	20	20
Hard Fescue	97%	85%	25	20	30	
Creeping Red Fescue	97%	85%	45	40	40	50
Fults Salt Grass	98%	85%*		10		

B. Use the specific mixture for the type of soil on the Project and the location of the seeding per Table 2, unless otherwise indicated on the Plans or designated by the Landscape Architect.

Table 2 - Soil Types and Location of Seeding

Symbol for Turf Seed Mixture	Soil Type	General Location	Rate of Seeding lbs/ac (kg/ha)
TDS	Dry Sandy to Sand Loam	Rural or Urban	250 lbs/acre
TUF	All Types	Urban Freeway, Blvds, City Streets	250 lbs/acre
TGM	Medium to Heavy	All	250 lbs/acre

Table 2 - Soil Types and Location of Seeding			
THM	Loamy to Heavy	Home and Business Turf	250 lbs/acre

C. Hydroseed with a blend of seed, fertilizer, and hydromulch.

2.2 MULCHING MATERIAL

A. Straw:

1. Small grain straw or grass or marsh hay acceptable to the Landscape Architect.

B. Wood Excelsior:

1. Green wood fibers, baled or blanket of type and manufacture acceptable to the Landscape Architect.
2. Make wood excelsior from green timber fiber, baled to weigh 80 to 90 pounds at the time of manufacture.
3. Make wood excelsior blankets from a uniform web of interlocking fibers with a backing of fabric netting on one (1) side only. Ensure the fabric net has a mesh size not exceeding 1-1/2 x 3 inch and is woven from cotton cord, twisted paper cord, or a synthetic, biodegradable fiber.
4. Produce blankets in the form of a tightly compressed roll 36 ±1 inch wide and approximately 120 feet long. Ensure the blanket has a fiber net on the outside of the fiber mat.
5. Ensure the blanket roll weight, when manufactured, averages 85 lbs ± 10%.
6. Place separator sheets of 40-pound Kraft paper at the beginning and end of each roll to facilitate unrolling and handling at the job site. Ensure the Kraft paper sheet at the end of each roll also forms a wrapper for the roll.

C. Netting:

1. Twisted Kraft paper or synthetic fiber, biodegradable woven mesh net material suitable for the application and acceptable to the Landscape Architect.
2. Make the net from a biodegradable mesh with openings not exceeding 1-1/2 x 3 inch.
3. Furnish the net in widths of not less than 35 inches.

D. Proprietary Mulch Material:

1. Biodegradable natural and/or synthetic materials suitably fabricated and acceptable to the Landscape Architect.

2.3 MULCH ANCHORING MATERIAL

A. Emulsified Asphalt:

1. ASTM D977, Rapid Setting (R.S. 1 or 2), Medium Setting (M.S. 2 or 2h) or Slow Setting (S.S. 1).

B. Mulch Anchoring Tool:

1. Suitable unit having a series of flat, notched discs for punching and anchoring mulch in soil, or a regular farm disc weighted and set nearly straight as a substitute.

C. Latex Base Adhesive:

1. Latex base adhesive mixed with water at a 25 to1 ratio of water to adhesive with 25 lbs of recycled newsprint as a tracer.

D. Recycled Newsprint:

1. Mix 7 lbs of newsprint with 7 gallons of water.

E. Guar Gum:

1. Mix 1 lb of dry adhesive with 26.5 gallons of water with 5 lbs of recycled newsprint as a tracer.

2.4 FERTILIZER

A. Use a standard commercial grade fertilizer, conforming to state regulations, of the type recommended for grasses. Ensure the fertilizer contains slow-release nitrogen amounting to 75% of the nitrogen available.

B. Ensure the fertilizer is uniform in composition, free-flowing, and suitable for application with the selected method.

C. Use fertilizer for hydraulic seeding that is soluble or ground to a fineness that permits complete suspension of all insoluble particles in the slurry.

2.5 AGRICULTURAL LIMING MATERIALS

A. Ensure burnt lime (quick lime), hydrated lime, limestone (calcite and dolomite), marble shells, and by-products conform to the requirements of ASTM C602.

2.6 WATER

A. Free of matter harmful to plant growth.

2.7 STAPLES

A. Use wire staples for holding mulching materials in place that are no less than 6 inches long, made of No. 11 (U.S. Steel Gage) steel wire or longer.

2.8 TOPSOIL

A. Use fertile, friable, sandy clay loam topsoil without admixture of subsoil. Ensure topsoil is free of glass, stones greater than 1 inch in any dimension, weeds, undesirable grasses, and other extraneous materials. Ensure the topsoil meets the following range of values:

Quality Parameter	Range of Value
Soil pH	5.0 to 7.5
Soluble Salts	500 ppm max
organic content	5 to 30 %
silt content	35% to 50%

clay content	5% to 10%
USDA Soil Classification	Loam or Sandy Loam
deleterious mat'l*	5% max
*rocks, gravel, stones, sticks, roots, sod, etc	

B. Compost may be mixed with topsoil to obtain the desired content. Topsoil is to be final screened thru a 5/8 inch maximum mesh screen prior to delivery to the Project site.

C. Have the Landscape Architect review the source and final screen results prior to the release of topsoil.

D. Submit a certified analysis of the topsoil from each source to the Landscape Architect.

E. Place topsoil in a minimum thickness of 3 inch throughout, or as specified in the Plans or Specifications.

F. Obtain the topsoil borrow pit source and secure all necessary permits and agreements for the use of such borrow pits at the Contractor's expense.

2.9 IMPROVED TOPSOIL

A. Make improved topsoil from a mixture of 2/3 topsoil and 1/3 compost. Ensure the mixture has a dark brown or black color, is capable of supporting plant growth without ongoing addition of fertilizers or other soil amendments, and has no objectionable odor.

2.10 COMPOST

A. Use mature/stabilized, humus-like compost derived from the aerobic decomposition of yard waste (i.e., grass clippings and leaves) or other designated compostable materials, in compliance with all federal and state laws. Ensure the mixture is free of objectionable odors, glass, plastic, metal, and other contaminants, as well as viable weed seeds and other plant parts capable of reproducing. Handle the mixture so that no visible water or dust is produced.

B. Ensure the manufacturer of the compost maintains annual test data and a statement on file with the Michigan Department of Agriculture, Pesticide and Plant Pest Management Division, showing that the following criteria are met by the compost provided for the project.

C. Ensure the composition of the compost falls within the following range of values:

Quality Parameter	**Range of Value**
Soil pH	6 to 7.5
Soluble Salts	2 to 5 mmho/cm
Carbon/Nitrogen Ratio	13 to 20 parts Carbon to 1 part Nitrogen
Inerts	< 1%
Organic matter	35 to 55 %
Nitrogen	1 to 2 %
Phosphorus	0.2 to 0.8 %
Potassium	0.5 to 1.5 %

Unit Weight	535 to 775 Kg/m3
Moisture Content	40 to 50 %
Particle Size	< 20 mm maximum
Water Holding Capacity	> 100%
Heavy Metals	None

1. Maturity/Stabilization: An acceptable test that can demonstrate Maturity/Stability.
2. Temperature: The compost material must have undergone the procedure to significantly reduce the pathogen level as referenced in EPA 40 CFR, Part 257 Regulations, Federal Register Vol. 58, No. 32, dated 2/19/93; Rules and Regulations. The temperature must be maintained at 40° C for 5 days with a temperature exceeding 55°C for at least 4 hours.
3. Pathogens and Trace Elements: Meet the requirements of EPA 40 CFR; Part 503 Regulations, Federal Register Vol. 58, No. 32, dated 2/19/93; Rules and Regulations.
4. Certify that the compost meets EPA 40 CFR, Part 257 and 503 Regulations, Federal Register Vol. 58, No. 32, dated 2/19/93, Rules and Regulations, to comply with the annual filing requirements.
5. Include a data sheet with the certification.
    a. Ensure the data sheet shows the following:
    b. Standard compost total nutrient test results, including N, P, K, Ca, Mg, Mn, Cu, Fe total carbon, pH, as provided by an acceptable testing laboratory
    c. Organic content
6. Inert contamination
    a. Soluble salts
    b. Carbon/Nitrogen ratio
    c. Proof of maturity/stability acceptable to the Michigan Department of Agriculture

PART 3 EXECUTION

3.1 PREPARATION OF SUBGRADE

A. Complete all fine grading within the areas to be covered with topsoil necessary to bring the surface of the proposed subgrade to the elevations indicated on the Plans and parallel to the proposed finished grade.

B. Rake or loosen the surface of the subgrade immediately prior to covering with topsoil to a minimum depth of 2 inch to facilitate bonding between the subsoil and topsoil.

3.2 PREPARATION OF SOIL

A. Bring the existing soil to a friable condition by harrowing or loosening and mixing to a depth of at least 4 inches after the areas to be seeded have been brought to the required grade and properly trimmed and cleaned up.

B. Thoroughly break lumps and clods. If the area to be seeded has been prepared and covered with a layer of topsoil as specified under Part 3 of this Section, this operation is not required.

3.3 PREPARATION OF MULCH MATERIAL

A. Prepare the mulched area for seeding by discing, using a spike-toothed harrow, or by other means acceptable to the Landscape Architect when the seed is to be sown through mulch that has been in place for more than two (2) weeks or is held in place by a surface-applied coating of asphalt emulsion or other adhesive.

3.4 PLACING AND SPREADING TOPSOIL

A. Place and spread topsoil over the area designated on the Plans, or as determined by the Landscape Architect, to a depth of 4 inches or to the depth specified on the plans.

B. Place topsoil to a depth sufficiently greater than that shown on the Plans or specified, so that, after natural settlement or rolling, the completed Work conforms to the lines, grades, and elevations shown on the Plans.

C. Complete the spreading of topsoil in a manner that allows seeding to proceed without additional moving of topsoil. Consider topsoil furnished and placed as incidental to seeding unless otherwise specified in the Proposal.

D. Rake and remove large earth lumps, rocks, roots, debris, or other foreign matter from the topsoiled area and legally dispose of them.

3.5 FERTILIZING

A. Apply chemical fertilizer to the prepared soil surfaces at a minimum rate of 660 lbs per acre of 12-12-12 fertilizer, or at such other rate of another fertilizer mixture that yields 240 lbs per acre of chemical nutrient.

B. Disc, harrow, or rake dry fertilizers thoroughly into the soil to a minimum depth of not less than 1 inch.

C. When hydraulic seeders are used for sowing seed, spread one-half of the recommended rate of fertilizer in combination with the sowing, and incorporate the balance into the soil prior to seeding. In all other cases, incorporate fertilizer into the soil before starting any seeding.

3.6 SEEDING

A. Sow seed at the rate specified in Table 2. Seed the area in the presence of an inspector using a mechanical spreader, hydraulic seeder, or broadcasting. Use the broadcasting method only in areas inaccessible to mechanical spreading equipment. Do not seed during winds above 15 mph.

B. Water topsoil to a depth of 4 inches at least 48 hours prior to seeding operations to obtain a loose, friable seed bed. Vary the time and depth of watering operations as directed by the Landscape Architect to accommodate varying site conditions.

C. Broadcast seed materials by spreading one-half of the specified amount of seed in one direction, then broadcast the remaining one-half of the seed at right angles to the first seeding pattern using the same broadcast method.

D. Broadcast at the rate specified herein or per the written recommendations of the Producer of the seed material used.

E. Roll seeded area with roller weighing a maximum of 150 lbs per foot of width.

F. Perform hydroseeding using suitably acceptable hydraulic seeding equipment and a homogeneous slurry solution of water, seed, fertilizer, and suitable mulch material as approved by the Landscape Architect. Distribute the seed slurry mixture uniformly at a rate approved by the Landscape Architect for the seeding and/or mulch materials used to suit the seed application rate. Apply seed at a rate of 300 lbs per acre.

3.7 MULCHING

A. Place mulch material on areas that have been or are to be seeded. Ensure the mulch is placed loosely enough to allow sunlight penetration and air circulation, but thick enough to shade the ground, reduce water evaporation, and prevent erosion by wind or water. Secure the mulch with suitably acceptable anchoring material.

B. For surfaces and slopes on which power equipment can be operated, satisfactory mulching materials include the following:

1. Small grain wheat straw or grass hay applied at 1-1/2 to 2 tons per acre with disc packer, asphalt or netting tie-down.

2. Wood chips applied at 6 to 9 tons per acre.

3. Asphalt emulsion alone at 600 to 1200 gallons per acre. (This application is suitable for limited periods of time and where trampling by either people or animals will not occur.)

C. For surfaces and slopes where power equipment cannot be operated, satisfactory mulching materials include the following:

1. Straw or grass hay applied at 1-1/2 to 2 tons per acre, anchored with asphalt or netting tie-down.

2. Asphalt emulsion alone at 600 to 1200 gallons per acre. (Limited to areas where tracking is not a problem.)

D. Anchor straw or hay mulch by the methods as specified herein.

E. Wood chips will not need anchoring when used on workable slopes.

F. Anchor commercially manufactured netting and/or fiberglass materials according to the manufacturer's printed instructions for the material used.

G. Punch and anchor mulch material into soil using mulch anchoring tool. Soil must be moist, free of stones and loose enough to permit disc penetration to a depth of 3 inches.

H. Blow on liquid or emulsified asphalt materials with the straw or hay mulch or spray or sprinkle asphalt tie-down materials immediately after mulch is spread.

1. Apply emulsified asphalt at 200 gal per acre.

2. Do not apply emulsified asphalt during freezing weather since it contains approximately 50% water.

3. Apply liquid (cut back) asphalt at approximately 485 gal per acre.

3.8 CONVERSION FROM SOIL PROTECTION TO PERMANENT VEGETATION

A. Following straw or hay mulching, grass seeding can be made in early spring by broadcasting seed directly into the mulch. Fertilizer or lime, where needed, should be incorporated into the soil before mulching.

B. Asphalt emulsion alone can be readily incorporated into the soil by ordinary tillage before seeding.

C. Wood chip mulch may be removed before seeding or incorporated deeply into the soil. If wood chips are incorporated into the soil, the addition of extra nitrogen fertilizer to the soil will be required to provide nitrogen in the new seeding.

D. Remove fiberglass mulch before seeding due to its permanence. Take care to prevent fiberglass filaments from becoming entwined or wound around shafts of power mowers or other power equipment.

E. Dispose of acceptable proprietary netting and erosion control materials in accordance with the manufacturer's printed instructions for the material used, prior to any seeding operations.

3.9 TURF ESTABLISHMENT

A. Water seeded areas whenever excessive drying is evident during the establishment period. Water in a manner that prevents erosion from excessive quantities, and ensure the watering equipment is of a type that prevents damage to the cultivated surfaces.

B. Take responsibility for the proper care of the seeded areas until final acceptance of the entire Work covered by the Contract.

C. Mow the seeded areas with mowing equipment acceptable to the Landscape Architect to a height of 2 inches whenever the average grass height reaches four 4 inches. Remove cut grass when the amount is heavy to prevent destruction of the underlying grass.

D. Mow or, in the case of rank growths, uproot, rake, and legally dispose of weeds or other undesirable vegetation that threaten to smother the planted species.

E. Reseed and mulch areas larger than 4 sq inches not having a dense, uniform, vigorous stand of grass acceptable to the Landscape Architect.

F. Extend the establishment period from the time of seeding until the seeded area has a uniform stand of grass acceptable to the Landscape Architect. The minimum period is 30 days.

G. If after 60 days from the initial seeding a dense, uniform, vigorous stand of grass has not been established by the Contractor, the Owner may reseed the defective areas and all costs will be deducted from the Contractor’s payments.

END OF SECTION

SECTION 32 92 23
SODDING

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section includes sodding complete with earth bed preparation, providing and placing topsoil, compacting and finishing topsoil, furnishing and placing sod, furnishing and placing stakes, watering sod, rolling and tamping sod, mowing sod, replacing defective or deteriorated sod and maintenance and care of sod in place.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 89 00 - Site Construction Performance Requirements

C. Section 31 22 00 - Grading

1.3 REQUIREMENTS OF REGULATORY AGENCIES

A. Comply with the applicable requirements of the Insect Pest and Plant Disease Act, Act 189 of 1931, as amended for all nursery grown sod.

1.4 SUBMITTALS

A. Submit copies of the Sod Growers Certificate to the Landscape Architect, indicating the nursery from which the sod was taken, the grass species, and the percentage in accordance with the Michigan State Department of Agriculture Regulations referenced above.

B. When requested by the Landscape Architect, submit evidence of topsoil borrow pit agreement for pits used by the Contractor.

C. Submit test results for imported topsoil.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver sod to the project site on suitable wooden pallets in manageable rolls. Ensure the amount of sod delivered does not exceed what can be installed in one 24-hour period. Reject sod that has been damaged during delivery.

B. Store sod in a manner that protects roots and grass material from wind, sunlight, freezing, or other injury. Stack sod with roots-to-roots or grass-to-grass in rolls. Keep sod moist during storage, under shade or covered with moistened burlap. Reject sod that has been damaged or deteriorated due to improper storage.

C. Handle sod in a manner that prevents breaking or other damage. Do not handle sod with pitchforks or by dumping from trucks or other vehicles. Retain the native soil on the roots of each sod roll during stripping and handling. Reject sod that has been damaged by handling.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Perform sod cutting and removal during soil moisture conditions as specified in Part 3 of this Section.

B. Do not place sod during drought or between the dates of June 1 and August 15, inclusive, unless approved by the Landscape Architect.

C. Do not place sod when the ambient air temperature is below 32 degrees F .

1.7 PROTECTION OF WORK

A. Provide suitably approved warning signs and barricades for protection of new sodding from pedestrian or vehicular traffic. Protect all newly sodded areas during the progress of the Work and until the completion of the turf establishment period.

B. Protect all adjacent construction from topsoil spills and perform such cleanup of affected surfaces before it becomes compacted by traffic.

1.8 PLANTING SCHEDULE

A. Contractor will be required to have a minimum of 90% of the sod placed at least one (1) month prior to final acceptance of the complete Project to ensure adequate rooting of the sod.

1.9 FINAL ACCEPTANCE

A. Establish a dense cover of sod grass on all disturbed areas and maintain these areas until final acceptance of the Work by the Landscape Architect.

B. Landscape Architect will inspect the sodded turf to ensure that the sod is well established, weed free, in a growing and vigorous condition. Re-sod areas that do not meet the Landscape Architect's approval at the Contractor’s expense.

PART 2 PRODUCTS

2.1 SOD - GENERAL

A. Use sod that consists of dense, well-rooted growths of perennial and desirable grasses, other than Merion Blue Grass, indigenous to the general locality where it is proposed for use.

B. Ensure sod is free of noxious weeds, relatively free of other weeds and undesirable plants, and free of large stones, roots, and other materials that might harm the growth, development, or future maintenance of the sod.

C. Use sod in strips of uniform width, not less than 10 inches wide, with lengths of not less than 18 inches and an area of not less than 4.5 sq feet.

D. Sod grown on peat will not be accepted.

E. Harvest sod to a uniform height. Mow vegetation taller than 4 inches to a height of 3 inches.

F. Harvest sod with the following average thickness:

1. Field Grown Sod - 2 inches

2. Nursery Grown Sod - 1 inch

2.2 NURSERY SOD

A. Use nursery sod per MDOT section 917, grown on mineral soil with a strong, fibrous root system. Ensure it is regularly fertilized and maintained according to established practices for at least two (2) years before cutting.

2.3 FIELD OR SALVAGE SOD

A. Salvage sod from areas to be disturbed during construction, or use field-grown sod that meets the specified requirements as indicated on the Plans or as directed by the Landscape Architect.

2.4 TOPSOIL

A. Use fertile, friable, sandy clay loam topsoil without admixture of subsoil. Ensure topsoil is free of glass, stones greater than 1 inch in any dimension, weeds, undesirable grasses, and other extraneous materials. Maintain the following range of values:

Quality Parameter	Range of Value
Soil pH	5.0 to 7.5
Soluble Salts	500 ppm max
organic content	5 to 30 %
silt content	35% to 50%
clay content	5% to 10%
deleterious mat'l*	5% max
* rock, gravel, stones, sticks, roots, sod, etc.	

B. Compost may be mixed with topsoil to obtain the desired content.

C. Screen topsoil through a 5/8 inch maximum mesh screen before delivery to the Project site. Have the Landscape Architect review the source and final screen results before releasing the topsoil.

D. Submit a certified analysis of the topsoil from each source to the Landscape Architect. Place topsoil in a minimum thickness of 4 inches throughout, or as specified in the plans or Specifications.

E. Obtain a topsoil borrow pit source and secure all necessary permits and agreements for its use at Contractor's expense.

2.5 IMPROVED TOPSOIL

A. Make the improved topsoil from a mixture of 2/3 topsoil and 1/3 compost. Ensure the mixture has a dark brown or black color, supports plant growth without ongoing fertilizers or soil amendments, and has no objectionable odor.

2.6 COMPOST

A. Use mature, stabilized, humus-like compost derived from the aerobic decomposition of yard waste (e.g., grass clippings and leaves) or other designated compostable materials, complying with all federal and state laws. Ensure the mixture is free of objectionable odors, glass, plastic, metal, and other contaminants, as well as viable weed seeds and

plant parts capable of reproducing. Handle the mixture in a way that produces no visible water or dust.

B. Maintain annual test data and a statement with the Michigan Department of Agriculture, Pesticide and Plant Pest Management Division, to show that the compost provided for the project meets the required criteria.

C. Ensure the compost composition falls within the following range of values:

Quality Parameter	Range of Value
Soil pH	6 to 7.5
Soluble Salts	2 to 5 mmho/cm
Carbon/Nitrogen Ratio	13 to 20 parts Carbon to 1 part Nitrogen
Inerts	< 1%
Organic matter	35 to 55 %
Nitrogen	1 to 2 %
Phosphorus	0.2 to 0.8 %
Potassium	0.5 to 1.5 %
Unit Weight	535 to 775 Kg/m3
Moisture Content	40 to 50 %
Particle Size	< 20 mm maximum
Water Holding Capacity	> 100%
Heavy Metals	None

1. Maturity/Stabilization – An acceptable test that can demonstrate Maturity/Stability.
2. Temperature – The compost material must have undergone the procedure to significantly reduce the pathogen level as referenced in EPA 40 CFR, Part 257 Regulations, Federal Register Vol. 58, No. 32, dated 2/19/93; Rules and Regulations. The temperature must be maintained at 40° C for 5 days with a temperature exceeding 55° C for at least 4 hours.
3. Pathogens and Trace Elements – Meet the requirements of EPA 40 CFR; Part 503 Regulations, Federal Register Vol. 58, No. 32, dated 2/19/93; Rules and Regulations.
4. To comply with the annual filing requirements, the supplier of the compost must certify that the compost meets EPA 40 CFR, Part 257 and 503 Regulations, Federal Register Vol. 58, No. 32; dated 2/19/93; Rules and Regulations.
5. Include a data sheet with the certification.
6. Ensure the data sheet shows the following:
    a. Standard compost total nutrient test results, including N, P, K, Ca, Mg, Mn, Cu, Fe total carbon, pH, as provided by an acceptable testing laboratory
    b. Organic content
    c. Inert contamination

d. Soluble salts

e. Carbon/Nitrogen ratio

f. Proof of maturity/stability acceptable to the Michigan Department of Agriculture

PART 3 EXECUTION

3.1 CONTRACTOR'S VERIFICATION

A. Prior to placing any topsoil, verify that earth bed in areas to receive sod have been completely stabilized to prevent settling and that grades have been made smooth, uniform and parallel to the finished grades and cross sections shown on the Plans.

B. Ascertain that the tops and bottoms of all slopes are rounded off to form vertical curves and have been found acceptable to the Landscape Architect.

C. Do no placing of topsoil until all earth bed conditions are accepted.

D. Prior to placing sod, verify that topsoil has been placed on the prepared earth bed to the proper depths shown on the Plans and as specified herein. Do not place any sod until topsoil conditions are satisfactory.

3.2 OFF-SITE SOURCE INSPECTION

A. Prior to commencement of sodding operations, notify the Landscape Architect of the off-site sources from which sod is to be furnished. Landscape Architect, at his discretion, will inspect the sod at the off-site source.

3.3 SOD HARVESTING

A. Harvest sod by cutting it into squares or rectangular sections. Ensure the rectangular sections vary in length but maintain equal width and a size that allows for lifting and rolling without breaking.

B. Take care during the stripping process and all other handling of the sod to retain the native soil on the roots.

C. Do not harvest sod until the off-site source inspection by the Landscape Architect is complete and the sod is accepted. Cut and move sod only when soil moisture conditions are suitable for favorable results.

1. When the soil is too dry, permission to cut sod may be granted by the Landscape Architect only after it has been sufficiently watered to moisten the soil to the depth at which the sod is to be cut.

3.4 PREPARATION OF SUBGRADE

A. Complete fine grading within the areas to be covered with topsoil to bring the proposed subgrade surface to the elevations indicated on the Plans and parallel to the proposed finished grade. Rake or loosen the subgrade surface to a minimum depth of 2 inches immediately before covering with topsoil to facilitate bonding between the subsoil and topsoil.

3.5 PLACING AND SPREADING TOPSOIL

A. Place and spread topsoil over the area indicated on the Plans or as directed by the Landscape Architect. Ensure topsoil is placed to a depth of 4 inches unless otherwise indicated in the Contract Documents. At a minimum, place topsoil in an amount greater than shown on the Plans so that, after natural settlement or rolling, the completed Work conforms to the lines, grades, and elevations indicated on the Plans.

B. Remove all large lumps, rocks, roots, debris, or other foreign matter from the topsoil by raking and dispose of it off-site. Complete spreading in a manner that allows sodding operations to proceed without additional movement of topsoil. Consider the furnished and placed topsoil as incidental to the sodding operations.

3.6 SODDING

A. Do not lay frozen sod or lay sod on frozen soil.

B. Lay sod within 24 hours after cutting and protect it properly during handling and placement. Lift sod from trucks or storage piles and place it on a moist earth bed by hand, ensuring close joints without overlapping. Plug all gaps between sod sections and openings at angles with additional sod.

C. Begin placing sod at the base of the slope and progress upward by carefully laying the sod in rows, with the lengths running at right angles to the slope.

1. Stagger the transverse joints of sod strips and lay the sod carefully to ensure tight joints.

2. When reaching the tops of slopes, carry the sod back at least 2 feet over the crest and trim it to a line parallel to the top of the bank. Grade the areas behind the crest beforehand, ensuring the surface of the sod, when placed, is 2 inches below the level of this area. Cover with a layer of topsoil at least 2 inches deep and compact it thoroughly to direct surface water runoff over the edge of the sod.

3. Stake sod on slopes steeper than one (1) vertical to three (3) horizontal, unless otherwise specified, using wooden pegs. Place at least one (1) peg in each piece of sod, with a maximum distance of two 2 feet between pegs. Drive pegs flush with the surface of the sod. Lay and stake the sod simultaneously.

4. Use ladders or treaded planks to prevent displacement of sod during sodding operations.

D. Roll the sod after initial watering, once the water has sufficiently soaked into the ground to prevent distortion or excessive compaction of the sod and soil. Use a water-filled roller at least 3 feet wide and 30 inches in diameter, weighing approximately 300 pounds, to ensure firm contact between the sod and soil. Use a tamper, acceptable to the Landscape Architect, to press the sod firmly in place in areas not accessible to the roller. After tamping or rolling, ensure the sod presents a smooth, even surface, free from bumps or depressions.

E. Reject damaged, deteriorated, or defective sod and remove it from the Project, unless otherwise specified. Reject sod that has dried out or become injured during transportation, handling, storage, or placing. If permitted by the Landscape Architect, pulverize suitable rejected sod and use it for filling, where necessary.

3.7 TURF ESTABLISHMENT

A. Water the sod until saturated immediately after laying. Water the sod whenever excessive drying occurs during the establishment period. Apply sufficient water to completely wet the sod and at least 2 inches of the sod bed each time watering is required. Water in a manner that prevents erosion due to excessive water application. Use watering equipment that prevents damage to the finished surfaces of the topsoil and sod. Continue watering as needed until the sod is firmly knit in place and in a vigorous growing condition.

B. Fertilize the sod two weeks after sodding at a rate of 900 lbs per acre of 5-20-20 (or equivalent nutrient) fertilizer.

C. Mow the sodded areas a minimum of three (3) times using mowing equipment acceptable to the Landscape Architect. Mow the sod to a height of 3 inches whenever the average grass height reaches 4 inches.

   1. When the amount of cut grass is heavy, remove heavy cuttings from the sodded areas to prevent damage to the underlying turf.

D. Mow or uproot, rake, and remove any weeds or undesirable vegetation threatening to smother the planted species. Legally dispose of all mowed cuttings, uprooted, or raked vegetation away from the Project Site.

E. Extend the establishment period from the time of sodding until the sodded areas receive final acceptance of the entire Work covered by the Contract. The minimum period is 45 days.

END OF SECTION

SECTION 33 05 07
UTILITY HORIZONTAL DIRECTIONAL BORING

PART 1 GENERAL

1.1 SCOPE OF WORK

A. The work specified in this Section consists of furnishing and installing underground utilities using the horizontal directional drilling (HDD) method of installation, also commonly referred to as directional boring. This work will include services, equipment, materials, and labor for the complete and proper installation; testing; restoration of underground utilities; environmental protection; and restoration.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 89 00 - Site Construction Performance Requirements

C. Section 31 23 16 - Structural Excavation and Backfill

D. Section 31 23 19 - Dewatering

E. Section 31 23 33 - Trenching and Backfilling

F. Section 33 14 00 - Water Utility Distribution Piping

G. Section 33 30 00 - Sanitary Utility Sewerage Piping

H. Section 33 31 00 - Sanitary Sewerage Piping

1.3 QUALITY ASSURANCE

A. Contractor will be responsible for the complete design of all methods used for directional boring including the implementation of all materials, tools, labor, and equipment proposed for use in the Work. Requirements set forth in this document specify a wide range of procedural precautions necessary to ensure that the very basic, essential aspects of a proper directional bore installation are adequately controlled. Adherence to the specifications contained herein, or the Landscape Architect's approval of any aspect of any directional bore operation covered by this specification, will in no way relieve the Contractor of their ultimate responsibility for the satisfactory completion of the work authorized under the Contract.

B. Requirements of Regulatory Agencies:

1. Federal, State, and Local Regulations:

   a. Conform to the requirements of all federal, state, and local regulatory agencies having jurisdiction.

2. Permits and Inspections:

   a. Where applicable, obtain and pay for permits and inspections for pipe directional boring operations as required by PA 451, State of Michigan, 1994, and all government and private agencies having jurisdiction. No additional compensation will be allowed because of the Contractor's failure to obtain and

pay for such permits and inspections. Be aware of and conform with Owner-obtained permits.

3. Occupation Health and Safety Requirements:

   a. Conform to the requirements of the Michigan State Department of Labor, Construction Safety Standards Commission Construction Standard, Part 14; Tunnels, Shafts, Caissons and Cofferdams, and the Michigan State Department of Public Health, Occupational Health Standards Commission, Occupational Health Standards, Part 2; Tunnels, Shafts, Caissons and Cofferdams.

1.4 REFERENCE STANDARDS

A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

B. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

C. ASTM C139 - Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes

D. ASTM D1784 - Standard Classification System and Basis for Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

E. ASTM D2447 - Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter

F. ASTM D2657 - Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings

G. ASTM D3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

H. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter

I. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

J. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

K. ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter

L. ASTM F1055 - Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing

M. ASTM F1962 - Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings

N. ASTM F2160 - Standard Specification for Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD)

O. ASTM F2164 - Standard Practice for Field Leak Testing of Polyethylene (PE) and Crosslinked Polyethylene (PEX) Pressure Piping Systems Using Hydrostatic Pressure

P. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

Q. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast

R. AWWA C153/A21.53 - Ductile-Iron Compact Fittings

S. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings

T. AWWA C651 - Disinfecting Water Mains

U. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm)

V. AWWA C906 - Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm), for Waterworks

W. NSF 14 - Plastics Piping System Components and Related Materials

X. Michigan Department of Transportation, Standard Specifications for Construction, latest edition

1.5 SUBMITTALS

A. Prior to beginning Work, Contractor will prepare and submit to the Landscape Architect for review, detailed plans and shop drawings showing the limits of the proposed directional boring Work; the materials, equipment and methods of construction proposed for use; the connection including all thrust blocking and bracing of the directionally bored carrier pipe to other pipe; the location of shafts, pits and/or approach tunnels to be constructed; the locations of existing utilities; the proposed bore path, and methods to be implemented for protection of personnel, excavations and adjacent structures, property and utilities.

B. Prior to beginning directional boring operations, submit copies of permits and inspection records obtained from state and local authorities having jurisdiction as described under Part 1 of this Section.

1.6 QUALIFICATIONS

A. Contractor will have actively engaged in the installation of pipe using directional drilling for a minimum of seven (7) years and have installed a minimum of 35,000 feet.

B. Field supervisory personnel employed by the Contractor will have at least 7 years' experience in the performance of the work and tasks as stated in the Contract Documents.

C. Polyethylene pipe jointing wil be performed by personnel trained in the use of butt-fusion joining equipment and electro-fusion joining equipment. Training will be performed by a qualified representative of the joining equipment and documented in writing.

1.7 JOB CONDITIONS

A. Where soil conditions or obstructions are encountered that prevent the completion of pipe directional boring Work started or in progress, develop and submit to the Landscape Architect for review alternate methods of performing the Work as described under Part 1 of this Section. Perform no additional Work until completion of review by the Landscape Architect of the alternate method proposed.

B. Protection

1. Provide structures, safety equipment and professional services required to provide for the health and safety of the general public and of personnel involved in pipe directional boring Work in accordance with the requirements of the regulatory agencies having jurisdiction.

2. Take measures necessary to protect surrounding public and private property, adjacent buildings, roads, drives, sidewalks, drains, sewers, utilities, structures, and appurtenances from damage due to pipe directional boring Work. Responsibility and payment for correction of such damage will be the sole responsibility of Contractor.

3. Pothole existing underground utilities including sanitary sewers, sanitary leads, storm sewers, water mains, water services, gas mains, gas services, telephone lines, cable television lines, oil lines, etc. to ascertain the clearance between the existing utilities and the pipe to be bored and to ensure the pipe boring will not adversely affect the existing utilities. Potholing is required and will not be paid for separately unless otherwise specified in the Proposal.

PART 2 PRODUCTS

2.1 GENERAL

A. Directional drilling equipment will consist of a directional drilling rig of sufficient capacity to perform the bore and pullback the pipe, a drilling fluid mixing and delivery system of sufficient capacity to successfully complete the crossing, a guidance system to accurately guide boring operations and trained and competent personnel to operate the system. Equipment will be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.

2.2 DRILLING RIG

A. Directional drilling machine will consist of a hydraulically powered system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine will be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the crossing. The hydraulic power system will be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system will be free of leaks. Rig will have a system to monitor and record maximum pull-back pressure during pull-back operations. The rig will be grounded during drilling and pull-back operations.

2.3 DRILLING SYSTEM

A. The drill head will be steerable by changing its rotation and will provide the necessary cutting surfaces and drilling fluid jets.

B. Mud motors will be of adequate power to turn the required drilling tools.

C. Drilling system will be constructed of high quality 4130 seamless tubing, grade D or better, with threaded box and pins. Tool joints should be hardened to 32-36 RC.

2.4 GUIDANCE SYSTEM

A. Magnetic Guidance System (MGS) or proven gyroscopic system will be used to provide a continuous and accurate determination of the location of the drill head during the drilling operation. The guidance will be capable of tracking at depths up to one hundred feet and in any soil condition, including hard rock.

B. The MGS will enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction). The guidance system will be accurate to +/- 2% of the vertical depth of the borehole at sensing position at depths up to one hundred feet and accurate within 18-inches horizontally.

C. The MGS will be of a proven type and will be operated by personnel trained and experienced with this system. MGS operator will be aware of magnetic anomalies on the surface of the drill path and will consider such influences in the operation of the guidance system if using a magnetic system.

2.5 DRILLING FLUID (MUD) SYSTEM

A. A self-contained, closed, drilling fluid mixing system will be of sufficient size to mix and deliver drilling fluid. Mixing system will continually agitate the drilling fluid during drilling operations.

B. Drilling Fluids:

1. Drilling fluid will be composed of clean water and appropriate additives including bentonite clay. Water will be from an authorized source with a pH of 8.5 to 10. Water of a lower pH or with excessive calcium will be treated with the appropriate amount of sodium carbonate or equal. The water and additives will be mixed thoroughly and be absent of clumps or clods. No potentially hazardous material may be used in drilling fluid.

2. The mud pumping system will be of an adequate capacity for delivering the drilling fluid at a constant pressure suitable for the Work. The delivery system will have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe will be relatively leak-free. Used drilling fluid and drilling fluid spilled during drilling operations will be contained and conveyed to the drilling fluid recycling system. A berm, a minimum of 12-inches high, will be maintained around drill rigs, drilling fluid mixing system, entry and exit pits and drilling fluid recycling system to prevent spills. Pumps and or vacuum truck(s) of sufficient size will be in place to convey excess drilling fluid from containment areas to storage and recycling facilities.

3. The drilling fluid recycling system will separate sand, dirt and other solids from the drilling fluid to render the drilling fluid re-usable. Spoils separated from the drilling fluid will be stockpiled for later use or disposal.

2.6 OTHER EQUIPMENT

A. Pipe rollers will be of sufficient size to fully support the weight of the pipe while being hydro-tested and during pull-back operations. Sufficient number of rollers will used to prevent excess sagging of pipe.

2.7 PVC WATER MAIN PIPE SYSTEM

A. Pipe:

1. For pipe size in sizes 4-inches through 60-inches in diameter, pipe will be AWWA C900, fusible, PVC, DR 18 (235 psi), ductile iron pipe size.
2. PVC pipe materials must be listed and approved for use with potable water under ANSI/NSF 14 and NSF 61. The exterior wall print line of PVC pipe must bear the AWWA C906 and the "NSF-pw" identification.
3. Pipe will be Certa-lok C900/RJ or Landscape Architect approved equal. Pipe will be Underground Solutions, Fusible C-900 or Landscape Architect approved equal.

B. Material: PVC per ASTM D1784

C. Cell Classification: 445474C per ASTM D3350

D. Fittings:

1. Fittings (tees, crosses, bends, sleeves, etc.) and plugs, where shown on the Plans, will be ductile iron compact fittings, restrained, mechanical joint type, with a pressure rating of 350 psi (2.4 MPa), conforming to AWWA C153/A21.53, and AWWA C111/A21.11, with double thickness cement mortar lining and coal tar enamel coating on the outside of fittings.
    a. Joining fittings to HDPE pipe will use fused mechanical joint adapters with ductile iron backup rings.
    b. Fittings on PVC water main will be restrained joint for PVC pipe designed for a working pressure of 200 psi.
        1) Restraint will be provided by a clamping ring with serration to provide positive restraint around the full circumference of the pipe.
        2) Coating on wedge assemblies and related parts will be two coats of heat cured liquid thermoset epoxy.
        3) Coating on casting bodies will be electrostatically applied and heat cured polyester.
        4) Acceptable manufacturers for PVC restrained fittings include:
            a) EBAA Iron – Megalug Series 15MJ00 (up to 12") (above 12" Series 2000PV) or approved equal.
2. Ductile Iron, ANSI A21.10 and A21.11, flanged type joint with 1/8 inch thick rubber gasket and flange ring, full-body, Class 250, with double thickness cement mortar lining.

E. Pipe Joints:

1. Non-Metallic, restrained joint couplings with high-strength, flexible, thermoplastic spline retainers. Retainers will be inserted into mating precision machined grooves in the pipe and coupling to provide full 360-degree restraint. Couplings will be designed for use at the rated pressures of the pipe and will incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F477.
2. Butt fusion or electrofusion welded.

F. Water Service Saddles:

1. Electrofusion corporation saddles with 1-inch brass outlet threads and brass corporation stops.
2. Stainless Steel, full circle, double bolt service saddle with spring washers and 1-inch brass outlet threads and designated by the manufacturer in writing as specifically approved for use on HDPE pipe; with brass corporation stops.
3. Bronze, full circle saddles with AWWA tapered thread outlet of the size indicated. Ford S90-_____, Mueller H-1344 or Landscape Architect approved equal. No U-Bolt type saddles are allowed.

G. Restraining Harness:

1. Ductile Iron, epoxy coated with serrated split rings on each end. EBBA Iron Series 1500 or Landscape Architect approved equal.

H. Allowable Leakage:

1. Pipe will be tested at 150 psi for 1 hour per ASTM F2164. Leakage allowance for fused PVC pipe joints is zero. The leakage allowance per joint for gasketed fittings (based upon 150 psi test pressure) is as follows:

Size	**6”**	**8”**	**10”**	**12”**	**14”**
Gal / Hour	0.010	0.013	0.017	0.020	0.023

2.8 PVC FORCE MAIN PIPE SYSTEM

A. PVC, AWWA C900, DR-21 (200 psi) ductile iron pipe size.

2.9 HDPE WATER MAIN PIPE SYSTEM

A. Pipe:

1. AWWA C906, DR 11 (Pressure Class 200), Ductile Iron Pipe size. All HDPE materials must be listed and approved for use with potable water under NSF 14. AWWA C906 and the “NSF-pw” identification.

B. Material: PE4710

C. Cell Classification: 445474C per ASTM D3350

D. Fittings:

1. Ductile iron fittings (where shown on the Plans) will be mechanical joint, ductile iron compact fittings conforming to AWWA C153/A21.53, with rubber gasket

joints conforming to AWWA C111/A21.11, with double thickness cement mortal lining and coal tar epoxy coating on the outside of the fittings. Joining ductile iron fittings to HDPE pipe will use fused mechanical joint adapters with ductile iron backup rings.

2. HDPE Fittings (tees, crosses, bends, etc.) and plugs will be Butt Heat Fusion Type, DR 11, per ASTM D3261 or Electrofusion Type, per ASTM F1055. Compression fittings are not allowed.

E. Pipe Joints: Butt Fusion Welded or Electrofusion Welded.

F. Valves and Hydrants:

1. As specified in Section 33 1100, Water Utility Distribution Piping.

2. Hydrant leads from the hydrant tee to the hydrant will be ductile iron pipe, AWWA C151, Class 54, PC 350, unless indicated otherwise on the plans.

a. Fittings for joining PVC C900 pipe to hydrant lead will be restrained joint for PVC pipe designed for a working pressure of 200 psi.

G. Water Service Taps:

1. Electrofusion corporation saddles with 1-inch brass outlet threads and brass corporation stops.

2. Stainless Steel, full circle, double bolt service saddle with spring washers and 1-inch brass outlet threads and designated by the manufacturer in writing as specifically approved for use on HDPE pipe; with brass corporation stops.

H. Allowable Leakage:

1. Pipe will be tested at 150 psi for 1 hours per ASTM F2164. Leakage allowance for fused HDPE pipe joints is zero. The leakage allowance per joint for gasketed fittings (based upon 150 psi test pressure) is as follows:

Pipe Diameter	**6”**	**8”**	**10”**	**12”**	**14”**
Gal / Hour	0.010	0.013	0.017	0.020	0.023

2.10 HDPE FORCE MAIN PIPE SYSTEM

A. Pipe:

1. Polyethylene, Nominal IPS OD, DR-11, Pressure Rating 200 psi, pipe less then 3-inch diameter will be in accordance with ASTM D3035 , pipe 3-inches and larger will be per ASTM F714.

B. Material: PE 4710

C. Cell Classification: PE 345464C per ASTM D3350

D. Joints: Heat Fusion Bonding, ASTM D2657 or Electrofusion Welded

E. Fittings:

1. Fittings (tees, crosses, bends, sleeves, etc.) and plugs, where shown on the Plans, will be Butt Heat Fusion Type, DR 11, per ASTM D3261 or Electrofusion Type, per ASTM F1055. Fittings for joining HDPE pipe to ductile iron or PVC AWWA C900 pipe or fittings will use fused mechanical joint adapters with ductile iron backup rings.

F. Allowable Leakage:

1. Allowable Leakage: Pipe will be tested at 150 psi for 1 hours per ASTM F2164. Leakage allowance for fused HDPE pipe joints is zero. The leakage allowance per joint for gasketed fittings (based upon 150 psi test pressure) is as follows:

Pipe Diameter	**6”**	**8”**	**10”**	**12”**	**14”**
Gal / Hour	0.010	0.013	0.017	0.020	0.023

2.11 TRACER WIRE

A. Reinforced 7 x 7 stranded copper clad steel wire with 50 mil High Density Polyethylene insulation. Continuous copper cladding metallurgically bonded to a steel core through a continuous solid cladding process. Bare wire 0.208-inch O.D., 4700 pounds breaking strength. Wire to be Copperhead® or equal.

2.12 OTHER MATERIALS

A. Concrete:

1. Concrete will conform to MDOT Section 1004, use Grade 3000 concrete; Type IA cement; MDOT 6A coarse aggregate; MDOT 2NS fine aggregate; 3 inch maximum slump; no admixtures without the Landscape Architect's approval.

B. Concrete Reinforcement:

1. In accordance with MDOT Section 905, use ASTM A615/A615M, Grade 60 for bars and ASTM A1064/A1064M for welded wire fabric.

C. Concrete Block:

1. Block cast from Portland cement sand, gravel or crushed stone, of uniform and compact texture, free from cracks or warpage and with square corners conforming to ASTM C139.

PART 3 EXECUTION

3.1 VERIFICATION

A. Prior to performing directional boring operations, verify grades, lines and levels to which the new Work is to be installed. Directional boring Work that requires adjustment of grades, lines and levels after Work has started will be at the expense of the Contractor performing the Work.

B. Prior to beginning directional boring Work, contact the local one call system for locating buried utilities (811). Also contact the local municipalities who may not be part

of the one call system, to mark their buried facilities. Excavate or pothole to verify in the field the location and elevation of existing active utilities and structures scheduled to remain and requiring protection from damage because of the Work. Existing utilities will include gas mains and services, water mains and services, sanitary sewers and house leads, oil lines, telephone lines and services, cable television lines and services, electric lines and services, and any other similar buried utilities.

C. Plan and plot a bore path and submit bore path to Landscape Architect in accordance with Part 1 of this Section. Notify the Landscape Architect where existing utilities directly affect the progress or performance of the Work. Contractor is responsible for excavation or potholing necessary to determine the elevation of existing utilities that cross the proposed water main at no additional cost to the Project unless otherwise indicated in the Proposal.

3.2 PREPARATION

A. Layout of the Work:

1. Stake, mark, and layout the Work using suitable stakes and markers to facilitate verification of grades, lines, levels, and locations of the Work to be performed in a manner acceptable to the Landscape Architect.

2. From reference points established by the Landscape Architect on the surface of the ground, carry line and grade down to the bottom of any shafts or boring pits. Perform the Work to the line and grades established using methods acceptable to the Landscape Architect. Protect such reference points throughout the progress of the Work.

B. Examination of Materials:

1. Prior to performing directional boring Work, examine new pipe for damage due to fabrication, shipment, or handling. Inspect pipe for cracks, breaks, bends, dents, broken ends, or other damage which might affect the structural integrity, performance requirements, or jointing as shown on the Plans, specified herein or as directed by the Landscape Architect. Defective pipe will be rejected by the Landscape Architect and will be removed from the Work and replaced with acceptable pipe at the expense of the Contractor.

C. Notifications:

1. Prior to performing directional boring Work, Contractor will notify applicable inspecting agencies under Part 1 of this Section, of Work Schedule with a minimum of two (2) working days' notice.

3.3 INSTALLATION

A. Except for the method of installation (directional boring versus open cut), the pipe will be installed per requirements of Section 33 11 00 Water Utility Distribution Piping, Section 33 34 00 Sanitary Utility Force Mains, and 33 31 10 - High Density Polyethylene (HDPE) Pipe and Fittings.

B. Sheeting, Shoring, and Bracing:

1. Furnish, install and maintaining throughout the progress of the Work, such sheeting, shoring, and bracing in tunnels, shafts, pits and trenches as may be required for safety of workmen, for protection of the Work and adjacent structures, and for issuance of applicable agency permits. Sheeting, shoring, and bracing will be removed after completion of the Work unless otherwise indicated on the Plans or directed by the Landscape Architect.
2. Design of earth supports will be the responsibility of the Contractor and will be as required by the nature of the soils encountered. Supports will be dimensioned and spaced as to prevent caving, loss of earth or squeezing within the neat lines of the excavation. Supports will effectively restrain movement of the adjacent soil.
3. The sheeting of pits along roads will be required if the leading edge of the pits falls within the one-on-one zone of influence from the shoulder point or curb and gutter edge.

C. Excavation:

1. Excavate as required to perform directional boring Work to the grades, lines and levels indicated on the Plans and as specified herein.
2. Construct approach trenches, pits and shafts of sufficient length and width to accommodate the equipment being used, the pipe units to be placed and the manpower working. Provide guide timbers or rails in the bottom of the trenches, pits and shafts for keeping the Work on line and grade.

D. Pipe:

1. Construction:
    a. Use the types and sizes shown on the Plans. Contractor will construct the pipe on the surface in the area indicated on the Plans. Use care to not damage pipe, joints or joint material. Coiled HDPE pipe will be re-rounded before using.
2. Connection to Structures and Existing Water Mains:
    a. Connecting HDPE pipe to manholes will be accomplished by butt fusion welding a flange adapter to the end of the pipe and fully embedding the flange adapter to the inside manhole wall.
    b. Final connections of HDPE pipe to existing water mains will be made after the new HDPE pipe has been allowed to relax for a minimum of 24 hours. Connections of HDPE pipe to existing water mains will consist of a full-circle Flex Restraint Collar fused to the HDPE pipe embedded in a 30” x 30” concrete thrust block poured to undisturbed earth placed a maximum of 5-feet from the connection point.
3. Hydrostatic Testing:
    a. The pipe will be hydrostatically tested twice for leakage, including a preliminary test after the pipe has been constructed on the surface, and an acceptance test after the pipe has been installed in the drilled hole. Contractor will furnish the pump, pipe connection, valves and other necessary apparatus including gauges, meters, and personnel necessary for conducting the test.

1) Hydrostatic testing for HDPE pipe will be in accordance with ASTM F2164.
2) Hydrostatic testing for PVC pipe will be in accordance with AWWA C605.
3) Before applying the test pressure, air willll be expelled from the pipe. If necessary to accomplish this, taps will be made at points of higher elevation and afterwards plugged.
4) Allow the test section to equalize to a common temperature and pressure. Gradually increase pressure to required test pressure.
5) HDPE pipe will be held at the test pressure for 4 hours prior to beginning the test to allow for stabilization of expansion of the pipe under test pressure.
6) Full pressure will be held for the length of time as specified in Part 2 of this Section.
7) Faulty pipe fitting, valves or other accessories which permit leaks during testing will be replaced by the Contractor with sound material and the test will be repeated until specified requirements are met.
8) If no visual leakage is observed, and pressure during the test phase remains steady (within 5 % of the test phase pressure) for the entire test period, a passing test is indicated.
9) The maximum permissible leakage measured by water meter from the section of main tested under pressure, will not exceed the rate as specified in Part 2 of this Section.
10) If retesting is necessary, depressurize the test section and correct faults or leaks in the test section.
11) Test sections will not exceed 2,000 feet. In the event more than 2,000 feet of water main is tested, the permissible leakage will remain at the amount determined for 2,000 feet of pipe.

4. Water for Testing:
   a. Water for testing will be obtained from a potable water supply. Contractor will provide water required at Contractor's own expense and Contractor will make the necessary arrangements with the authority which controls the source of water system for water. Contractor will be governed in using the water by the rules and regulations imposed thereon by said authority.
   b. Contractor will provide and remove temporary connections between the source water system and the mains constructed under this Contract. Temporary connections will meet the approval of the Landscape Architect, the authority controlling the source water system, and public health authorities having jurisdiction.
5. Installation:
   a. After satisfactory hydrostatic testing, the Contractor will install pipe with continuous pullback until the pipe is in place as indicated on the plans. No

connections to the pipe will be made for a period of 24 hours after the continuous pullback has been completed.

6. Installing Fittings (fire hydrants, gate valves, tees, crosses, etc.):
    a. Where required, fittings will be cut into the new pipe after it is bored and allowed to relax sufficiently. The new pipe will be excavated and precision cut.
    b. Prior to cutting fusible PVC the pipe, the pipe will be scored around the full circumference of the pipe as recommended by the manufacturer to prevent the pipe from splitting.
    c. Fittings will be installed on the new pipe with cutting in sleeves. Mechanical joints will be the restrained type suitable for PVC C900 pipe.
    d. Connections of HDPE pipe to mechanical joint fittings will use mechanical joint adapters with ductile iron backup rings fusion welded to each end of the pipe.
7. Disinfection:
    a. Water main will be disinfected per AWWA C651. Bacteriological analysis and sampling will be in accordance with AWWA C651 and Section 33 14 00 - Water Utility Distribution Piping.
    b. For HDPE pipe, disinfection with solutions containing chlorine will not contain more than 12.5% active chlorine.
8. Water Services Connections:
    a. Water services connections greater than 1 inch installed on directional bored fusible PVC pipe will be:
        1) a tee cut into the pipe as noted above, or,
        2) a service saddle inside of a restraining harness to relieve the axial stress and keep the pipe from splitting when tapped. Contractor will verify dimensions of service saddle and restraining harness prior to construction.
    b. Water services connections will be:
        1) For HDPE pipes, electrofusion corporation saddle with 1-inch brass outlet threads and brass corporation stops as noted above.
        2) For HDPE pipe, stainless steel, full circle, double bolt service saddle with spring washers and 1-inch brass outlet threads and brass corporation stop. Saddle will be designated by the manufacturer in writing as specifically approved for use on HDPE pipe.
9. Tracer Wire:
    a. Tracer wire will be installed end to end or structure to structure for directionally drilled pipe. Contractor will ensure integrity of the wire is not compromised during pull back. Dis-continuity of the wire will require a new, continuous wire being pulled in over the path of the water main.

3.4 DRILL PATH SURVEY

A. Entire drill path will be accurately surveyed with entry and exit stakes placed in the appropriate locations within the areas indicated on Drawings. If Contractor is using a magnetic guidance system, drill path will be surveyed for surface geo-magnetic variations or anomalies. Submit completed bore path complete with line and grade references and pulling loads imposed to Landscape Architect at completion of directional boring Work.

3.5 DRILLING PROCEDURE

A. Pilot hole will be drilled on bore path with no deviations greater than 5% of depth over a length of 100 feet. In the event that pilot does deviate from bore path more than 5% of depth in 100 feet, Contractor will notify Landscape Architect and Landscape Architect may require Contractor to pull-back and re-drill from the location along bore path before the deviation.

B. In the event that a drilling fluid fracture ("frac out"), inadvertent drilling fluid returns, or drilling fluid loss occurring during pilot hole drilling operations, Contractor will cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a March funnel and then wait another 30 minutes. If mud fracture or returns loss continues, Contractor will cease operations and notify Landscape Architect. Landscape Architect and Contractor will discuss additional options and work will then proceed accordingly.

C. Upon successful completion of pilot hole, Contractor will ream bore hole to the minimum amount necessary to accommodate outside diameter of pipe. Contractor will not attempt to ream at one time more than the drilling equipment and mud system are designed to safely handle.

D. After successfully reaming bore hole to the required diameter, Contractor will pull the pipe through the bore hole using a swivel in front of the pipe. Once pull-back operations have commenced, operations must continue without interruption until pipe is completely pulled into bore hole. During pull-back operations Contractor will not apply more than the maximum safe pipe pull pressure at any time.

E. In the event that pipe becomes stuck, Contractor will cease pulling operations to allow any potential hydro-lock to subside and will commence pulling operations. If pipe remains stuck, Contractor will notify Landscape Architect. Landscape Architect and Contractor will discuss options and then work will proceed accordingly.

3.6 PULLING LOADS

A. The maximum allowable tensile load imposed on the pipeline pull section will not exceed the following amounts:

1. Allowable Tensile Load:

Nominal Size (inches)	HDPE (lbs)	PVC (lbs)
1-1/4	860	
2	1,875	

3	4,072	
4	6,879	10,600
6	14,215	21,900
8	24,455	37,800
10	36,788	56,500
12	52,025	80,800
14	69,895	108,000
16	90,399	139,000
18	113,536	175,000
20	139,306	210,000
24	198,748	300,000
30	305,748	

B. The amount of pull applied to the pipe will be controlled and limited by devices such as hydraulic pressure regulator or a load sensor between the pulling equipment and the pipe.

3.7 PIPE TESTING

A. Following successful pull-back of pipe, Contractor will hydrostatic test the pipe per the requirements of this Section. After successful completion of hydrostatic test, pipe will pigged dry.

B. After completion of hydrostatic test and before connection to the water supply, the pipe will be chlorinated and tested per the requirements of AWWA C651 and Section 33 14 00 - Water Utility Distribution Piping.

3.8 BACKFILLING

A. After the pipe has been installed and approved by the Landscape Architect, the Contractor will backfill the entrance/exit pits, approach trenches or shafts. The entrance/exit pits, approach trenches or shafts and other excavations, will be considered as open cut trench and will be backfilled as specified in Section 31 23 33 - Trenching and Backfilling. Special backfill will apply where they exceed the maximum allowable trench width.

3.9 ACCEPTANCE AND INSPECTION

A. Contractor will maintain line and grade and will provide the Landscape Architect with as-built location at five-foot intervals. If unable to maintain line and grade or to maintain directional boring operations, Contractor will propose alternate methods of construction as specified under Part 1 of this Section to complete the Work.

B. Water main will be inspected and accepted under Section 33 14 00 - Water Utility Distribution Piping.

C. If excavation or installation Work done by the Contractor is to be abandoned or not completed, the Contractor will fill voids and spaces caused by the abandoned Work, as directed by the Landscape Architect.

3.10 RECORD KEEPING, AS-BUILTS

A. Contractor will maintain a daily project log of drilling operations and a guidance system log with a copy given to Landscape Architect at completion of project. As-built drawings will be certified as to accuracy by Contractor.

END OF SECTION

SECTION 33 14 00
WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section includes water main Work complete with water main piping, valves, hydrants, thrust blocks, valve wells, structures, fittings, joints, joint materials, nuts, bolts, glands, gaskets, plugs and accessories as shown and required. This Section also includes bedding and laying of water main piping, hydrostatic testing of new water main piping systems, flushing and chlorination of water main piping systems.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 33 00 - Submittal Procedures

C. Section 01 77 00 - Closeout Procedures

D. Section 31 23 16 - Structural Excavation and Backfill

E. Section 31 23 19 - Dewatering

F. Section 31 23 33 - Trenching and Backfilling

1.3 REQUIREMENTS OF REGULATORY AGENCIES

A. Conform to the applicable requirements of State and local health authorities having jurisdiction for disinfection and testing of water mains.

B. Ensure water main piping and appurtenances are NSF 61 certified. Stamp the certification on the exterior wall of the pipe/appurtenance.

1.4 REFERENCE STANDARDS

A. Conform the Work of this Section to the applicable portions of the following Standard Specifications, unless otherwise specified:

1. ASTM A48/A48M - Standard Specification for Gray Iron Castings
2. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
3. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
4. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength
5. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
6. ASTM B88 - Standard Specification for Seamless Copper Water Tube
7. ASTM B98/B98M - Standard Specification for Copper-Silicon Alloy Rod, Bar and Shapes

8. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
9. ASTM B766 - Standard Specification for Electrodeposited Coatings of Cadmium
10. ASTM C55 - Standard Specification for Concrete Building Brick
11. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete
12. ASTM C139 - Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes
13. ASTM C150/C150M - Standard Specification for Portland Cement
14. ASTM C478/C478M - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
15. ASTM C595/C595M - Standard Specification for Blended Hydraulic Cements
16. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
17. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
18. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
19. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
20. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
21. AWWA C104/A21.4 - Cement–Mortar Lining for Ductile-Iron Pipe and Fittings
22. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
23. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems
24. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast
25. AWWA C153/A21.53 - Ductile-Iron Compact Fittings
26. AWWA C200 - Steel Water Pipe, 6 In. (150 mm) and Larger
27. AWWA C205 - Cement–Mortar Protective Lining and Coating for Steel Water Pipe—4 In. (100 mm) and Larger—Shop Applied
28. AWWA C207 - Steel Pipe Flanges for Waterworks Service, Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm)
29. AWWA C209 - Tape Coatings for Steel Water Pipe and Fittings
30. AWWA C210 - Liquid-Epoxy Coatings and Linings for Steel Water Pipe and Fittings
31. AWWA C218 - Liquid Coatings for Aboveground Steel Water Pipe and Fittings

32. AWWA C222 - Polyurethane Coatings and Linings for Steel Water Pipe and Fittings
33. AWWA C300 - Reinforced Concrete Pressure Pipe, Steel-Cylinder Type
34. AWWA C301 - Prestressed Concrete Pressure Pipe, Steel-Cylinder Type
35. AWWA C504 - Rubber-Seated Butterfly Valves
36. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances
37. AWWA C602 - Cement–Mortar Lining of Water Pipelines in Place-4 In. (100 mm) and Larger
38. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings
39. AWWA C651 - Disinfecting Water Mains
40. AWWA C800 - Underground Service Line Valves and Fittings
41. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm)
42. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 3⁄4 In. (19 mm) Through 3 In. (76 mm), for Water Service
43. AWWA C909: Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 In. (100 mm) and Larger
44. MDOT - Michigan Department of Transportation, Standard Specifications for Construction, latest edition and _____
45. NSF 14 - Plastics Piping System Components and Related Materials
46. NSF 61 - Drinking Water System Components - Health Effects

1.5 SUBMITTALS

A. Tabulated Laying Schedule:

1. Submit a Tabulated Laying Schedule to the Landscape Architect when using concrete water main pipe in the water main Work. Include stationing, deflection, elevation, slope, and a description of the pieces. Do not start pipe manufacture until the Landscape Architect has reviewed the laying schedule.

B. Product Data:

1. Submit catalog data showing pipe sizes, and manufacturing standards, as well as design calculations for internal pressure, vacuum and external load conditions, for both non-restrained and restrained joints.

C. Schedule of Corporation Stops (Tapping Outlets):

1. Keep a complete schedule of all tapping outlets installed in concrete water main piping and submit it to the Landscape Architect at the end of each water main piping section or on the last day of each week, whichever occurs first.

D. Affidavits:

1. Submit the manufacturer’s affidavit of compliance with the Contract Documents to the Landscape Architect. The affidavit must include the following, where applicable:
    a. Pipes, specials and fittings (AWWA C200)
    b. Cement-mortar protective lining (AWWA C205 and AWWA C602).
    c. Tape coating for the exterior (AWWA C214 and AWWA C209).
    d. Shrink wrap for exterior (AWWA C216).
    e. Paint system for the exterior (AWWA C210, C218 or C222).
    f. Manufacturer's standard repair procedures.
    g. Manufacturer's written quality control procedures.
    h. Manufacturer's Installation Instructions: Indicate special installation requirements.
    i. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements

E. Restrained Joints:
    1. Submit manufacturer’s data for restrained joint pipe and fittings for the Landscape Architect’s review.

F. Testing Plan:
    1. Submit a plan detailing flushing limits of pipe to be tested, bleed down points, proposed water source, and water disposal method and location. The plan should include proposed disinfection chemical and dechlornation method, as well as how the chemical will be introduced into the pipe and how the treated water will be dechlorinated prior to disposal.

1.6 CLOSEOUT PROCEDURES

A. Submit the following in accordance with Section 01 77 00:
    1. Manufacturer's field reports.
    2. Project record documents:
        a. Accurately record actual locations of piping mains, valves, connections, and invert elevations.
        b. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
    3. Provide a final record laying schedule.
    4. Submit certified copies of hydrostatic test results of completed force main sections as specified in Part 3 of this specification.

1.7 DELIVERY OF MATERIALS

A. Provide two (2) percent of prestressed concrete pipe lengths to be delivered as short pieces, each 10 feet or less. These short pieces must be in addition to those required under the Tabulated Laying Schedule.

1.8 STORAGE OF MATERIALS

A. Store pipe in a manner that minimizes infiltration of dirt, debris, and other extraneous materials.

B. Do not stack piping materials higher than 4 feet. Provide suitable racks, chairs, and other supports to protect preformed pipe mating surfaces from damage. Store bottom tiers off the ground, alternate tiers, and chock tier ends.

C. Store hydrants, valves, wells, and prefabricated structures off the ground, drained, and kept free of water to prevent damage from freezing. Keep hydrants, valves, wells, their accessories, and appurtenances in their original containers until ready for installation.

D. Protect gaskets, glands, joint, and sealing materials from ultraviolet or ozone attack by storing them in suitable enclosures, away from sunlight, atmosphere, and weather, until ready for installation.

1.9 HANDLING OF MATERIALS

A. Load and unload piping using suitably approved hoists and skidding. Do not drop, bump, or allow piping to impact against itself. Reject any damaged piping.

B. Use lifting devices suited to the Work and ensure they protect surfaces from damage.

PART 2 PRODUCTS

2.1 GENERAL

A. It is the intent of the Articles in Part 2 of this specification section is to specify in detail the various types of pipe, joints, and fittings which have been indicated throughout the Plans and Specifications.

B. Do not construe these Articles as allowing any alternate type of material other than what is indicated on the Plans or elsewhere in the Specifications.

2.2 DUCTILE IRON PIPE SYSTEM

A. Use Ductile Iron Pipe that meets AWWA C151/A21.51, with cement mortar lining inside and a 1-mil (25 µm) minimum thickness asphaltic coating outside. Ensure the pipe has a minimum wall thickness class for the pipe nominal inside diameter as indicated on the Plans or specified in the Proposal.

B. Use compression gasket type mechanical joints for ductile iron pipe, conforming to AWWA C111/A21.11. Do not allow slots with the same width as the diameter of the bolt holes in mechanical joints on the bell flange.

C. Use push-on, compression gasket type joints that conform to AWWA C111/A21.11. Mark the spigot of the pipe to visually determine when the spigot is fully seated in the bell of the adjoining section.

D. Use ductile iron compact fittings and plugs with mechanical joints, pressure rating of 350 psi, conforming to AWWA C153/A21.53. Ensure rubber gasket joints conform to

AWWA C111/A21.11. Apply double thickness cement mortar lining and coal tar enamel coating on the outside of fittings.

E. Use flexible ball and retainer type joints that are boltless, locking, and capable of being deflected up to 15 degrees.

F. Ensure cement mortar linings for ductile iron pipe conform to the requirements of AWWA C104/A21.4 at the specified thickness. Set the lining permanently before applying any additional pipe coating.

2.3 PRESTRESSED CONCRETE PRESSURE PIPE SYSTEMS

A. Use prestressed concrete, embedded cylinder type concrete piping with a 175 psi plus d-load design pressure, conforming to AWWA C301. Apply a seal coat in accordance with AWWA C104/A21.4 as applicable.

B. Use push-on, steel ring, gasket type joints for concrete pipe, conforming to AWWA C300 or AWWA C301.

C. Use fittings that conform to AWWA C300, Type A, with concrete or mortar lining and reinforced concrete or mortar exterior covering. For Type B, use cut and welded steel plate, mortar coated on both interior and exterior.

D. Seal coat concrete pipe with bitumastic concrete penetrant conforming to AWWA C104/A21.4. Apply after pipe has cured.

2.4 POLYVINYL CHLORIDE (PVC) PIPING SYSTEMS

A. Use rigid polyvinyl chloride bell and spigot type pressure pipe and couplings, size 4 inches and larger, that conform to AWWA C900, Pressure Class 235, DR 18, unless otherwise indicated in the Contract Documents.

B. Use rigid polyvinyl chloride bell and spigot type pressure pipe and couplings, smaller than 4 inches, that conform to ASTM D2241, SDR 21, pressure class 200.

C. Use molecularly oriented polyvinyl chloride (PVCO) pipe, sizes 4 to 24 inches, that conform to AWWA C909, pressure class 200, unless otherwise indicated in the Contract Documents. Allow PVCO pipe only when specifically called for in the Contract Documents.

D. Use compounds for PVC pipe and components that are suitable for potable water products as required by NSF 14 and NSF 61. Stamp the exterior pipe wall with NSF-pw. Mark the spigot end of the pipe to visually confirm when the spigot is fully seated in the bell of the adjoining pipe.

E. Use joints for PVC pipe that are push-on or mechanical elastomeric gasket type, conforming to ASTM D3139.

F. Allow PVC fittings only when called for on the Plans. When permitted, use 4-inch and larger PVC fittings and plugs with a 200-pound (1380 kPa) Pressure Class, conforming toAWWA C900, in the types and sizes indicated on the Plans. Use ASTM D2241 for PVC fittings smaller than 4 inches, when permitted.

G. Use ductile iron fittings and plugs for PVC pipe, unless specified otherwise, in accordance with the specifications for Ductile Iron Pipe Systems in Part 2.

H. Use elastomeric seal type gaskets for PVC pipe, conforming to ASTM F477.

I. Use manufacturer's standard nontoxic pipe joint lubricants, conforming to AWWA C900.

2.5 RESTRAINED JOINTS

A. Follow the specifications for restrained joints as outlined in the Plans or Specifications.

1. Design restrained joints for ductile iron pipe and fittings to handle a working pressure of 350 psi. Ensure joints allow for deflection after assembly. Use one of the following methods for restraints:

a. A positive axial lock between the bell interior surface and a retainer welded on the spigot end of the pipe.

b. A thrust restraint wedge which embeds in the pipe with twist off nuts to control wedge setting.

2. Design restrained joints for PVC water main pipe to handle a working pressure of 200 psi. Provide restraint across the joint where the restrained portion connects to fittings, using a clamping ring anchored to the fitting with T-head bolts or stainless-steel rods.

a. Incorporate clamping rings with serrations on the inside surface in restraining devices for PVC water main pipe to provide positive restraint on the outside surface. Ensure full support around the circumference of the pipe to maintain its roundness.

b. Apply two coats of heat-cured liquid thermoset epoxy on wedge assemblies and related parts. Coat casting bodies with electrostatically applied and heat-cured polyester.

2.6 POLYETHYLENE ENCASEMENT

A. Use 4 mil high-density, cross-laminated polyethylene film or 8 mil linear low-density polyethylene film for encasement, as per AWWA C105/A21.5.

2.7 VALVES AND HYDRANTS

A. Butterfly Valves:

1. Use rubber-seated tight-closing butterfly valves that conform to the latest revision of AWWA C504.

2. Class 150 Valves (Non-Cyclic Applications)

3. Use flangeless wafer body style valves, suitable for ANSI 150-pound flanges. Ensure the bodies are cast iron and rated at 175 psi. All flangeless wafer valve bodies must have bolt guides to center the body in the pipeline.

4. Furnish valves with self-lubricated bearings made of TFE-coated stainless steel. Provide shaft seals to prevent leakage and protect bearings from internal or external corrosion.

5. Use reinforced resilient valve seats that are field replaceable. Ensure seats also serve as body liners to prevent flow from contacting the body casting.

a. Design seats with flange sealing to ensure a positive seal without the need for flange gaskets.

b. Use Buna-N or EPDM seats suitable for potable water applications.

6. Use one-piece 316 stainless steel shafts with a diameter suitable for the specified service conditions.

7. Finish grind shafts to minimize bearing and shaft seal wear. Install a non-adjustable thrust collar on shafts of valves 12 inches and larger.

a. Equip shaft seals with a stuffing box and pull-down packing gland. Provide self-adjusting “V” type packing for the seals.

8. Make discs from aluminum bronze. Use Type 316 stainless steel for the disc-to-shaft connections.

9. Machine pins, shafts, and discs of all valves individually for complete interchangeability.

10. Provide valves with field-interchangeable manual or powered actuators as required. Design the actuator-to-shaft connection to shear and prevent internal valve damage if the disc closes on foreign material in the pipeline.

11. Factory Testing: Conduct tests on each valve according to the Manufacturer’s Quality Control procedures.

12. Mark butterfly valves with the valve size, manufacturer’s mark, year of manufacture, and class.

13. Manufacturer: Use valves from DeZurik, Val-Matic, Clow, or an approved equal.

B. Gate Valves:

1. Insert community standard here

C. Fire Hydrants:

1. Insert community standard here

D. Air Release Valves:

1. Use air release valves with an ASTM A126 Class B cast iron body and cover. The valves must have a threaded inlet connection as shown on the plans or listed in the schedule and a 1/2 inch NPT outlet connection.

2. Equip the valve body with a 2 inch NPT plugged port near the base for cleanout of large solids. Install a 1/2 inch NPT connection near the top and a 1 inch NPT port near the bottom for the installation of flushing attachments.

3. Use an 18-8 stainless steel float and a replaceable seat made of Buna-N or another suitable material. Ensure the internal linkage mechanism is 18-8 stainless steel; plastic or bronze materials are not acceptable.

4. Design the linkage mechanism to be removable from the cover without disassembling the mechanism.

5. Design the valve with a 3/16 inch diameter stainless steel orifice for working pressures up to 150 psi. Ensure the valve closes drop-tight.
6. Design the valve to automatically exhaust accumulated air from a fluid system while maintaining pressure and operation.
7. Equip each valve installed below grade with a flood-safe kit to prevent inflow during submerged conditions.

2.8 TAPPING SLEEVES

A. Use cast iron or ductile iron tapping sleeves with a pressure rating of 250 psi, mechanical joint sleeves conforming to AWWA C153/A21.53. Furnish the sleeves complete with valves, stops, caps, plugs, and joint accessories as indicated on the Plan. The sleeve must be of a 2-section type.

B. When approved by the Owner, use tapping sleeves made of 18-8 Type 304 stainless steel with a full circumference band, bolts, nuts, and washers. Ensure the sleeves are rated for a working pressure of 250 psi. Use Buna-N gaskets and flanges that meet the requirements of AWWA C207, with fusion-bonded epoxy coated carbon steel.

2.9 VALVE BOXES

A. Use 3-piece valve boxes with a 5-1/4 inch diameter, screw type, gray iron castings. The valve boxes must consist of a base section, bottom section, and top section with a lid, all conforming to ASTM A48/A48M, Class 20. Adjust the overall length to meet the grade.

2.10 CORPORATION STOPS

A. Use water service bronze for corporation stops, couplings, and plugs as detailed on the Plans, specifying the type and size.

2.11 SERVICE SADDLES

A. Use water service saddles compatible with the main and service lead. Ensure straps are made of ductile material to prevent crushing and deforming the main. Install a molded rubber or neoprene gasket to fully encircle the tapped opening, ensuring a watertight connection. Do not use lead gaskets.

B. Water service saddles must be bronze with AWWA tapped threads.

C. Use double strap, full circular service saddles for PVC water main, ensuring uniform bearing around the circumference. Do not use U-bolt type straps.

2.12 CURB STOPS

A. Water service bronze of types and sizes detailed on the Plans.

B. Include an extension type, 3-piece curb box with extension type base, foot piece, one-piece lid, and a 3-foot stationary rod for curb stops, unless specified otherwise.

2.13 THREADED FITTINGS

A. Conform threads for water main service fittings to the requirements of AWWA C800 and AWWA C800 "Appendix for Materials" where indicated on the Plans.

2.14 WATER SERVICE PIPE

A. Use Type "K" soft copper conforming to ASTM B88, with flared fittings.

B. Use polyvinyl chloride conforming to ASTM D2241 or ASTM D1785 Schedule 40.

C. HDPE, conforming to AWWA C901, PE 4710, DR 11, PC200,

2.15 RESTRAINTS, CLAMPS, RODS, AND TIES

A. Use high-strength low-alloy steel or stainless steel conforming to AWWA C111/A21.11. Use bronze alloy or corrosion-protected steel for balls and fittings.

2.16 STRUCTURES

A. Conform water main structure materials to the details on the plans and the requirements listed below:

1. Use concrete brick conforming to ASTM C55, Grade S-II, solid units of nominal 3 inch thickness.

2. Use concrete block conforming to ASTM C139 shape, scored as detailed and approved.

3. Ensure precast concrete structures conform to ASTM C478/C478M, circular with circular reinforcement as detailed. Include lifting holes in precast units where indicated.

2.17 MANHOLE STEPS

A. Use cast iron manhole steps conforming to ASTM A48/A48M, Class 30, with a minimum cross-section dimension of 1 inch (25 mm) in any direction.

B. Use steel-reinforced plastic manhole steps made of suitably approved co-polymer polypropylene, conforming to ASTM D4101, PP0344B33534Z02. Reinforcement must include a minimum diameter of 1/2 inch deformed reinforcing bar, conforming to ASTM A615/A615M, Grade 60.

C. Make manhole steps of the types and sizes indicated on the Plans. Ensure compliance with applicable state and federal occupational and safety standards.

2.18 COVERS AND FRAMES

A. Make structure frame and covers of the types and sizes detailed on the Plans. Use ASTM A48/A48M, Class 30, gray iron castings for the covers. Ensure castings are neatly made, free from cracks, cold sheets, holes, and other defects. Grind casting surfaces to assure proper fit and prevent rocking. Make units frost-proof and provide tapping screws and anchors where indicated on the Plans.

2.19 BOLTS, STUDS, AND NUTS

A. Use bolts, studs, and nuts as specified on the Plans. Conform to the requirements of AWWA C111/A21.11 and the ASTM standards listed below:

1. Bronze ASTM B98/B98M

2. Steel ASTM A307, Grade B

3. Cadmium Plating ASTM B766, Grade NS

4. Zinc Coating ASTM A153/A153M or ASTM B633, Type GS

B. Make tee head bolts and nuts of high strength, low alloy steel conforming to AWWA C111/A21.11. Apply a ceramic-filled, baked-on fluorocarbon resin coating.

2.20 CONCRETE

A. Conform concrete to MDOT Section 1004 . Use 3,000 psi strength; Type IA cement; MDOT 6A coarse aggregate; MDOT 2NS fine aggregate; 3 inch maximum slump; no admixtures without Landscape Architect's approval.

2.21 FLOWABLE FILL

A. Flowable Fill for filling abandoned Water Mains.

1. Materials:

a. Cement: Conform cement to ASTM C150/C150M or ASTM C595/C595M.

b. Fly Ash: Ensure fly ash has a maximum loss on ignition of 12 percent and meets the other requirements of ASTM C618 (Class F).

c. Meet water requirements of ASTM C94/C94M.

2. Mixture Strength: (50 to 100 psi

a. Fly ASh: 2,000 lbs/cyd minimum

b. Cement: 100 lbs/cyd minimum

c. Sufficient water to produce the desired flowability (approximately 700 lbs/cyd)

B. Ensure the temperature of the flowable fill mixture as manufactured and delivered is at least 50 degrees Fahrenheit.

C. The flowable fill can be mixed by pugmill, central concrete mixer, ready mix truck, turbine mixer, or other acceptable equipment or method.

D. Submit a history of the mix design for seven (7) day and 28 day strengths, along with any other technical information. Include the design mix as part of the submittals for the project.

2.22 TRACER WIRE

A. Copper clad steel wire with 30 mil High Density Polyethylene insulation. Concentric copper cladding metallurgically bonded to a steel core through a continuous solid cladding process. Copper cladding to measure 3% minimum of the overall wire diameter. Wire to be 12 AWG, 0.0808 inch diameter, 0.0024 inch nominal copper thickness, 9.5270 ohms nominal resistance per 1,000 feet, 675 pounds breaking strength. Wire to be Copperweld ® or equal.

2.23 ACCEPTABLE MANUFACTURERS

A. Flexible Joint Pipe:

1. Acceptable manufacturers include: "F141," Clow, "Usiflex," U.S. Pipe, or equal.

B. Restrained Joints:

1. Acceptable manufacturers for restrained joints for ductile iron pipe include: Griffin Pipe Products Company, “Snap-Lok” or “Bolt-Lok”; American Cast Iron Pipe Company, “Lok-Ring” or “Lok-Fast”; United States Pipe and Foundry Company, “TR Flex”; Ebaa Iron “Megalug” or Landscape Architect approved equal.
2. Acceptable manufacturers for restrained joints for PVC pipe include: Ebaa Iron, “Megalug” or Landscape Architect approved equal.

C. Valve Boxes:

1. Acceptable manufacturers include: "A-295 Three Piece Screw Type," Traverse City Iron Works; "F2450," Clow, "Series 6860, Tyler," or Landscape Architect approved equal.

D. Corporation Stops:

1. Acceptable manufacturers include: Hays; Crane; Mueller; Ford; or Landscape Architect approved equal.

E. Service Saddles:

1. Acceptable manufacturers include: "Twin Seal," Clow, "Hays Seal," Hays, "Service Saddles," Mueller, or Landscape Architect approved equal.

F. Curb Stops

1. Acceptable manufacturers include: Hays, Ford, Mueller, or equal.

PART 3 EXECUTION

3.1 CONTRACTOR'S VERIFICATION

A. Prior to the installation of any water main piping or materials, examine all trenches and other excavations for the proper grades, lines, levels and clearances required to receive the new Work. Ascertain that all excavation bottoms, compacted subgrades and pipe bedding are adequate to receive water main materials to be installed. Correct all defects and deficiencies before proceeding with the work.

B. Expose the existing water main piping and structures to which the new work connects and notify the Landscape Architect. The Landscape Architect will verify the vertical and horizontal locations of the existing system and inform the Contractor of any necessary adjustments to align the new water main work with the existing system.

3.2 PREPARATION

A. Remove all lumps, blisters, and excess coatings from the socket and plain ends of the pipe. Wire brush and wipe clean the outside surfaces of all plain ends and the inside surfaces of all socket ends before installation. Scrub any pipe or fitting with heavily chlorinated water if it has acquired a coating of mud or other foreign material.

B. Examine pipe fittings, valves, hydrants, accessories, and appurtenances carefully for damage and other defects immediately before installation. Reject and remove defective or damaged materials from the Project.

3.3 INSTALLATION - GENERAL

A. Prevent foreign matter from entering the pipe while placing it in the trench. During and after laying operations, do not place debris, clothing, or other materials in the pipe.

B. Carry watertight plugs along during the progress of all water main Work and insert them in the end of each pipe as it is laid to prevent foreign matter or rodents from entering. Fasten the watertight plug securely in the end of the water main to prevent it from floating or being displaced whenever construction operations are temporarily halted, such as at noon or at the end of the day's Work.

C. Ensure each section of pipe, when placed to grade and line, has firm bearing on the trench bedding throughout its length between bell holes.

D. Cut pipe with approved tools and methods suitable for the pipe material. Employ pipe cutting methods that produce a smooth, square-cut end without damaging the pipe and minimize airborne particles. Follow the manufacturer's recommendations for the type of pipe material being cut and adhere to best trade practices.

E. Take care when cutting pipe or fittings to prevent damage to linings and coatings. Reject any section with damaged linings. Correct damage to exterior coatings to meet original Specifications.

F. Where pipe using a resilient gasket to effect the seal is cut, taper the cut pipe end at a 30-degree angle to the centerline of the pipe and grind the outside end smooth to remove any sharp edges or burrs that could damage the gasket.

G. Lay pipe with bell ends facing in the direction of laying, unless otherwise specified. After placing a length of pipe in the trench, center the spigot in the bell end of the adjacent pipe section, shove the pipe into position, align it, and secure it with sand tamped under and on both sides of the pipe, except at bell holes. Provide adequate support for all water main pipe.

H. Install the pipe bedding material after excavating the trench bottom, in accordance with Section 31 23 33. Install the pipe strictly following the manufacturer's recommendations. Continue the bedding above the pipe as specified in Section 31 23 33 after laying the pipe. Take particular care to fill and tamp all spaces under, around, and above the top of the pipe.

I. Provide a continuous and uniform bedding in the trench for all buried pipe, as specified in Section 31 23 33.

J. Backfill according to the Plans and as specified in Section 31 23 33.

K. Install bolts, studs, and nuts of the specified type following the manufacturer's installation and torquing requirements. Paint steel bolts, studs, and nuts with bituminous paint after installation.

3.4 INSTALLATION OF DUCTILE IRON PIPE

A. Install ductile iron water main in accordance with the most current version of AWWA C600.

B. Make push-on joints using a compression-type push-on resilient gasket. Prelubricate the gasket before installation with a lubricant recommended by the pipe manufacturer. Identify seated joints by the visible mark on the spigot of the installed pipe section.

C. Make mechanical joints with bolts, a molded resilient gasket, and a cast iron follower gland. Screw the nuts up finger tight before using a wrench. Bring the gland and rubber gasket up evenly at all points around the bell flange, then torque according to the manufacturer's recommendations.

D. Cover exposed portions of bolts with mastic.

E. Assemble, handle, and install flexible joint pipe in accordance with the printed recommendations provided by the manufacturer of the piping materials. Ensure handling and installation methods are acceptable to the Landscape Architect.

3.5 INSTALLATION OF CONCRETE PIPE

A. Joint pipe and fittings using a resilient gasket and steel spigot ring. Lubricate the resilient gasket and install it to form a watertight joint between the bell and spigot of the pipe.

B. Lay pipe in accordance with the accepted tabulated laying schedule and the Plans. Install short lengths of pipe 10 feet as specified in part 1 of this Section and evenly distribute them along the line of the Work, if required.

C. Clean and properly lubricate the bell of the pipe in place, then install the pipe section. After the spigot is fully entered into the bell and the gasket is fully compressed and shaped, check each gasket for proper position around the full circumference of the joint before driving the pipe home and completing the installation.

D. Provide cloth bands wired around each joint's outside diameter and grout with Portland cement mortar grout. Completely fill the annular recess between the adjoining bell and spigot pipe ends. Fill annular spaces between pipe ends on the inside of joints for pipes 24 inches or more in diameter with Portland cement mortar grout.

3.6 INSTALLATION OF POLYVINYL CHLORIDE PIPE

A. Lay polyvinyl chloride pipe with gasketed joints in complete accordance with AWWA C605 and the pipe manufacturer's published instructions. Lubricate the joints sufficiently using the pipe manufacturer's recommended lubricant.

B. Insert gaskets for pipe joints with the painted edge facing the end of the bell. Push each length of pipe home individually. Position the pipe so the reference mark on the spigot end aligns with the bell end.

C. Install tracer wire along with PVC water mains. Ensure the tracer wire is continuous from end to end and terminates at each structure with enough length for easy connection to utility tracing equipment. Test the wire for continuity after installation. Replace any wire that fails the continuity test.

3.7 INSTALLATION OF RESTRAINED JOINTS

A. Provide restrained joints where indicated on the plans. Assemble joints in strict accordance with the manufacturer’s directions. Fully extend joints after assembly.

3.8 FITTINGS, STRAPPING, AND LUGGED PIPE

A. Install all fittings to the lines, levels and locations indicated on the Plans.

1. Construct thrust blocks as indicated on the plans or as required by the Landscape Architect.
2. Provide fittings with restraints as specified herein, as indicated on the Plans, or as required for a functional installation.

B. Secure bends in water main piping and piping runs subject to impact reaction by means of metal strapping where indicated on the Plans or as determined by the Landscape Architect. Install all necessary bands, tie rods, nuts, and washers. Avoid using metal strapping in direct contact with polyvinyl chloride pipe.

C. Where lugged pipe and special fittings are indicated on the Plans, furnish and install all necessary tie rods, nuts, and washers.

3.9 POLYETHYLENE ENCASEMENT

A. Encase ductile iron water main, fittings, and hydrants in a polyethylene film tube where called for on the plans.

B. Install the polyethylene film tube in accordance with AWWA C105/A21.5, Method A.

1. Method A consists of cutting the polyethylene tube two feet longer than the pipe to provide an overlap at the joints.
2. Make service taps, bends, tees, and other connections to polyethylene encased pipe in accordance with Section 4.4.6 of AWWA C105/A21.5.

C. Make the cost of the polyethylene encasement incidental to the water main.

3.10 VALVES

A. Install valves to the grade, lines, levels, and locations indicated on the Plans.

B. Make valve connections as specified for the piping materials used. Set valves with the stem plumb on permanent, firm foundations as indicated on the Plans.

C. Support valves with special supports where required, as indicated on the Plans and approved by the Landscape Architect. Install valves so they do not receive support from the connecting pipe.

D. Do not use valve installation to bring misaligned pipe into alignment.

3.11 WATER MAIN STRUCTURES

A. Construct water main valve wells and structures to the grades, lines, and levels indicated on the Plans and as specified. Complete structures with concrete bases, reinforcing, frames, covers, adjustment rings, and any other components required for a complete installation.

B. Construct water main structures to the type of construction and dimensions indicated on the Plans and as described below.

1. Block Structures:

a. Construct concrete block structures in the locations and according to the details on the Plans. Place the first course of concrete blocks on the prepared base or footings in a full bed of mortar.

b. Make mortar joints full and close in all courses. Ensure joints are uniform in thickness throughout the structures. Strike all joints and properly point to provide true, smooth surfaces.

c. Ensure courses are level throughout. Stagger joints in adjoining courses by one-half the length of the block, as nearly as practicable.

2. Precast Concrete Structures

a. Construct precast concrete structures as detailed on the Plans. Provide mortar joints struck smooth.

b. Provide two (2) to four (4) courses of 8 inch brick at top of structure for future adjustment.

C. Apply a cement mortar plaster coat to the exterior surfaces of all brick or block gate wells and other water main structures indicated on the Plans. The plaster coat must be 1/2 inch thick and applied to the outer surfaces of the structures.

D. Provide and install cast iron covers, frames, adjusting rings, anchors, and other components to the elevations shown on the Plans and as required. Set castings in a full bed of cement mortar, 1/2 inch thick minimum. Strike mortar joints smooth.

E. Install steps for structures of the types and in the locations indicated on the Plans. Install steps on 16 inch centers, unless shown otherwise on the Plans.

F. Place pipe in structures for inlet or outlet connections so it extends through the walls and beyond the outside wall surfaces a sufficient distance to allow complete connections. Seal openings between pipes and walls with a full bed of cement mortar. Support pipe with concrete supports.

3.12 VALVE BOXES

A. Install valve boxes to the grade, lines, levels, and locations indicated on the Plans. Ensure valve boxes do not transmit shock or stress to the valve, and set them plumb with covers centered over operating nuts and flush with the indicated surface elevations. Uncover and reset any valve boxes that shift or fill during backfilling.

3.13 HYDRANTS

A. Install all hydrants plumb to the lines, levels, grades, and locations indicated on the Plans. Set hydrants to the established grade, ensuring their nozzles are parallel to or at right angles to, and facing the grade or curb.

B. Plug hydrant drain/weep holes.

C. Install additional pipe between the water main and road box where necessary to adjust for proper hydrant location. Install hydrant and valve extensions to adjust the hydrant to the proper grade.

D. Plumb all hydrants at the time they are set using a plumb line or other means acceptable to the Landscape Architect.

E. Recheck all hydrants for plumb and grade upon substantial completion of cleanup. Make all necessary adjustments at this time. Consider the work of constructing fire

hydrants complete only after these final adjustments for plumb and grade have been made.

3.14 FIRE HYDRANT APPROACHES

A. Construct fire hydrant approaches using culvert pipe with end protection and a gravel approach.

B. Use culvert pipe of the size and type shown on the Plans. Install the culvert pipe to match the existing or proposed grade of the drain or ditch with pipe bedding and backfill from a point below the pipe to a point 12 inches above the top of the pipe.

1. Use bank run sand meeting the requirements of MDOT Class II granular materials for pipe bedding and compact it to 95% of maximum unit weight.

C. Protect each end of the culvert pipe against erosion, as shown on the Plans.

D. Extend the gravel approach from the edge of the traveled portion of the road to the fire hydrant for a minimum of 10 feet.

1. Construct the gravel approach with a minimum of 6 inches of compacted MDOT 22A or 23A aggregate aggregate.

3.15 AIR RELEASE ASSEMBLY

A. Provide all materials and construct air release assemblies as indicated on the Plans. Install all valves, fittings, caps, plugs, and piping as required. Use fittings and joint materials for air release assemblies as specified for the water main piping materials used.

3.16 BLOW-OFF ASSEMBLY

A. Provide all materials and construct blow-off assemblies as indicated on the Plans. Install blow-off assemblies and pipe to the lines, levels, and elevations shown.

B. Install all valves, fittings, reducers, piping, plugs, joints, etc., as detailed. Install blow-off assemblies on stable, undisturbed earth materials. Provide changes in directions and returns with bedding and restraints as indicated on the Plans, as specified herein, and as required for a complete installation.

C. Include valve boxes in blow-off assemblies as detailed.

3.17 TAPPING VALVE ASSEMBLY

A. Install all tapping valve assemblies of sizes and to the lines, elevations, locations and details indicated on the Plans.

B. Assemble the tapping sleeve around the main and perform the tapping in strict accordance with the manufacturer's recommendations.

C. Accomplish tapping without interrupting service.

3.18 ANCHORS, ENCASEMENTS, AND RESTRAINTS

A. Provide plugs, tees, sleeves, bends, caps, straps, and lug piping with suitable anchors, encasements, and restraints as indicated on the Plans. Follow detailed anchoring, encasement, and restraint methods. Use all bearings as shown.

B. Rest anchors, encasements, and restraints on firm, stable, compacted subgrade. Provide them for all standard and special fittings.

3.19 WATER SERVICE LINES

A. Provide water service lines in accordance with this Section when indicated in the Proposal or on the Plans. Otherwise, water service lines are not required.

B. Install water service lines after successfully testing and putting the water main into service, including installing fire hydrants. Use service lines of the type indicated on the Plans and with a minimum size of 3/4 inch or as otherwise indicated on the Plans or Proposal.

C. Provide water service lines for all lots or parcels at locations indicated on the Plans, within these Contract Documents, or as designated by the Landscape Architect. Extend service lines from the water main to within 1 foot of the limits of a right-of-way or easement at a minimum 5 foot depth, terminating with a curb stop and curb box as specified herein.

D. Install water service lines under concrete or asphalt pavements by boring or tunneling, unless otherwise indicated on the Plans or approved by the Landscape Architect.

E. Backfill open cut construction for water services in accordance with Section 31 23 33, after laying the service line, including curb stop, and obtaining approval from the Landscape Architect. Request inspection and obtain approval of the service line from the Landscape Architect prior to backfilling.

F. Alternative methods such as hydraulic jacking; air jetting; piston mole; etc, may be used to install water service lines if approved by the Landscape Architect. The proposed method must be approved by the governmental agency having jurisdiction over the work area and the Contractor must demonstrate that, in the opinion of the Landscape Architect, the method is suitable for local soil and ground conditions.

1. To be found suitable for local conditions, the method must be demonstrated to perform within acceptable horizontal and vertical accuracy limits, must not compress soil beyond acceptable limits, and must not leave voids in the soil.

2. Do not permit water jetting.

3. Complete final installation of the service pipe in accordance with the manufacturer's recommendations. Do not allow joints or fittings under roadway surfaces.

G. Keep existing water mains in service until connecting all water services to the new mains. Repair all water services damaged during the installation of the new water mains. Make service connections to the new mains only after testing, accepting, and putting the new mains into service.

H. Reconnection of Water Services

1. Make the connection of existing service lines to the new mains within the street rights-of-way or within the easements, utilizing the existing curb stops.

2. Abandon existing lead water service lines and install new water service lines from the new water main to the water meter.

I. Follow this Section's specifications for backfill, method of construction under pavements, and new water service lines.

3.20 CORPORATION STOPS

A. Locate corporation stops on water main piping where indicated on the Plans or as determined by the Landscape Architect.

B. Make corporation stops on PVC water mains with full circle service saddles.

C. Install a minimum of two (2) corporation stops in each valve well.

D. Install one 1 inch tapping outlet at approximately 20 foot intervals along the entire length of the concrete water main.

1. Construct these tapping outlets as detailed on the Plans and position them 45 degrees off vertical.

2. Mark the location of tapping outlets with a No 4 reinforcing rod. Place the rod in a vertical position immediately adjacent to, but not touching, the water main, with the top 6 inches below finished grade.

3.21 SERVICE SADDLES

A. Remove all loose material from the entire circumference of the main where installing service saddles. Install the saddle and tap the main in accordance with the manufacturer's recommendations.

3.22 CURB STOPS

A. Install curb stops of the types and sizes indicated on the Plans. Furnish and install a curb box with each curb stop.

3.23 ABANDONING WATER MAIN

A. Install cap with a minimum 2 inch diameter threaded opening at one end of water main to be abandoned and solid cap at opposite end.

B. Install a minimum 2 inch diameter stand pipe no farther than from the end with the solid cap in the top of the water main to be abandoned. The stand pipe should be installed such that it can be removed after use and the hole sealed.

C. Install a minimum 2 inch diameter drain pipe in the threaded opening at the opposite end of the water main from the stand pipe. Bend the drain pipe up to a 90-degree angle, with the end of the pipe a minimum of 6 inches above the top of the water main.

D. Use the stand pipe to fill the water main to be abandoned with flowable fill material. Place the material in the water main until free water flows from the drain pipe at the opposite end.

E. Continue filling water main until the material released at the drain pipe is representative of the flowable fill being introduced at the fill end of the water main, at which time the drain pipe will be sealed with a threaded cap and the filling terminated.

F. Remove the stand pipe and cap the filling hole.

3.24 RELOCATE WATER MAIN

A. Relocate water main by removing and relaying the existing water main to avoid an existing or proposed utility. Remove and dispose of existing pipe. Install bends and vertical anchors as shown on the Plans. Ensure vertical anchors and thrust blocks resist thrust forces sufficiently.

3.25 ABANDON EXISTING GATE VALVE AND WELL

A. Abandon gate valve wells and other water main structures on the existing water main in accordance with the following:

1. Remove and salvage the existing frame and cover during the abandonment of existing structures. Open the valve. Break down masonry to an elevation at least 3 feet below the subgrade.
2. Backfill the abandoned structure with flowable fill to 1 foot above the pipes and fill the remainder of the structure with a sand-cement mixture at a 10 to 1 ratio to subgrade elevation or to 1 foot below finished grade.

3.26 REMOVE GATE VALVE AND WELL

A. Remove gate valve wells and other water main structures on the existing water main in accordance with the following:

1. Remove and salvage the existing frame, cover, and valve during the removal of existing structures.
2. Plug and brace the ends of the existing water main. Remove and dispose of the complete structure entirely.
3. Backfill the excavation with sand and compact it to 95 percent of its maximum unit weight.

3.27 REMOVE EXISTING FIRE HYDRANTS

A. Excavate and remove existing fire hydrants, gate valves, and valve boxes on the existing water main.

1. Cap and block the existing hydrant lead.
2. Salvage the fire hydrant, valve, and box, and deliver them to the location designated by the Owner.
3. Backfill the excavation with sand and compact it to 95 percent of its maximum unit weight.

3.28 RELOCATION OF FIRE HYDRANTS

A. Include new hydrant shoes, frost jackets, and restraints in the relocation of hydrants. Provide all new materials required for hydrant relocation.

1. Reinstall hydrants at the new locations to the lines and levels shown.
2. Make all joint connections to new or existing water mains, joints, couplings, etc., as shown and as required.
3. Provide all anchorage and restraint for a complete installation.

3.29 HYDROSTATIC TESTING

A. General:

1. Hydrostatically test the pipe for leakage after laying and backfilling.
2. Hold a meeting with the Landscape Architect, Contractor, affected subcontractors, and Owner prior to testing mains, valves, hydrants, and appurtenances.
3. Notify the Landscape Architect in writing at least 48 hours prior to hydrostatic testing of mains, valves, hydrants, and appurtenances.
4. Furnish the pump, pipe connection, hydrants, valves, any other necessary apparatus including gauges and meters, and all personnel necessary for conducting the test.
5. Expel all air from the pipe before applying the test pressure. Make taps at points of higher elevation if necessary, then plug them afterward.
6. Have the Landscape Architect witness and accept the hydrostatic testing.
7. Test sections will normally not exceed 1 mile and in the event more than one 1 mile 1) mile (1.6 km) of water main is tested, the permissible leakage will remain at the amount determined for one (1) mile (1.6 km) of pipe.
8. Conform hydrostatic testing to AWWA C600.

B. Testing Ductile Iron Water Main

1. Make the test at a minimum pressure of 150 psi gauge. Hold the full pressure for at least two (2) hours.
2. Replace any faulty pipe fittings, gate valves, or other accessories that permit leaks during testing with sound material. Repeat the test until meeting specified requirements.
3. Limit maximum permissible leakage measured by water meter from the tested main section to 10.49 U.S. gallons per inch diameter of main per mile of pipe in 24 hours (1.079 liters per millimeter diameter of main per kilometer of pipe per 24 hours).

C. Testing PVC Water Main

1. Make the test at a minimum pressure of 150 psi gauge. Hold the full pressure for at least two (2) hours.
2. Replace any faulty pipe fittings, gate valves, or other accessories permitting leaks during testing with sound material. Repeat the test until meeting specified requirements.
3. Limit maximum permissible leakage measured by water meter from the tested main section to 10.5 U.S. gallons per inch diameter of main per mile of pipe in 24 hours (0.971 liters per millimeter diameter of main per kilometer of pipe per 24 hours).

3.30 FLUSHING

A. After completion of water main installation , flush the new mains, valves, hydrants and appurtenances completely.

1. Complete flushing prior to hydrostatic pressure testing and chlorination.

2. Notify the Landscape Architect in writing at least 24 hours prior to flushing mains, valves, hydrants, and appurtenances.
3. Have the Landscape Architect witness and accept the flushing.

B. Control heavily chlorinated water discharged from a disinfected system adequately to protect any surface water resource or adjacent property from potential environmental damage or creation of a hazard to traffic.

C. Remove and dispose of all temporary installations at completion of the flushing operation.

D. After flushing and prior to final system approval, pump down all fire hydrants and verify that the hydrant valve seats properly to prevent the hydrant standpipe from filling with water.

3.31 DISINFECTION

A. Disinfect the water main before making any connections to existing water mains. After satisfactory hydrostatic testing and flushing of the new water main, disinfect the complete system in accordance with AWWA C651 by introducing a chlorine-water solution throughout the water main piping.

B. Apply the liquid mixture using a solution-feed chlorinating device. Install a corporation stop and feed the chlorine solution through the corporation stop at the beginning of the main or valved section.

C. Let a slow flow of water into the main at the point of chlorine solution injection, maintaining a rate to achieve at least 25 parts per million (ppm) chlorine dosage in the entering water. Maintain an open discharge at the far end of the section being chlorinated, and continue introducing chlorine solution and water until the water discharging at the far end carries the required chlorine dosage.

D. Open each outlet from the main as it fills with chlorinated water and draw off sufficient water to ensure the full dosage of chlorine reaches each outlet.

E. Prevent back pressure that could cause a reversal of flow in the main being chlorinated. Maintain pressure in the main at a level that prevents chlorinated water from entering other sections of the main or water system.

F. Keep the chlorine-treated water in the main for at least 24 hours. At the end of that time, ensure the chlorine residual at pipe extremities and other representative points is at least 10 ppm. If the chlorine residual is less than 10 ppm, apply additional chlorine and repeat the retention period until the required 10 ppm residual is obtained.

G. Repeat the chlorination procedure for all or any section of the mains if, in the opinion of the Landscape Architect, the initial treatment proves ineffective. Continue until confirmed tests show that water sampled from the new mains meets the specified requirements.

H. Collect water samples and perform analyses at Contractor’s own expense.

I. Ensure the testing laboratory and sample collection meet the approval of the public health authorities having jurisdiction.

3.32 WATER FOR CLEANING, TESTING AND DISINFECTION

A. Obtain water for cleaning, testing, and disinfection from a potable water supply.

B. Provide all required water at Contractor's own expense and make necessary arrangements with the authority controlling the water source. Follow all rules and regulations imposed by that authority regarding water use.

C. Provide and remove temporary connections between the source water system and mains constructed under this contract. Ensure temporary connections meet approval of the Landscape Architect, the authority controlling the source water system, and public health authorities having jurisdiction.

3.33 BACTERIOLOGICAL ANALYSIS

A. Collect not less than two (2) consecutive water samples, taken 24 hours apart, for bacteriological analysis prior to placing a water main in service. Ensure each analysis shows results meeting state and local drinking water standards.

B. Collect water samples and perform analyses at Contractor's own expense.

C. Collect samples in accordance with AWWA C651.

D. Ensure testing laboratory and sample collection meet approval of the public agency having jurisdiction.

3.34 CLEANING (PIGGING)

A. Mechanically clean all water mains when required in the plans or specifications. Use a metal-bodied, mandrel-type solid plug (pig) with scrapers. Pull or otherwise propel the pig through the entire line prior to testing or connecting to any existing water main.

END OF SECTION

SECTION 33 41 00
STORM UTILITY DRAINAGE PIPING

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section includes storm sewer Work indicated on the Plans complete with pipes, joints, structures, pipe bedding, final inspection and appurtenances.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 33 00 - Submittal Procedures

C. Section 03 30 00 - Cast-in-Place Concrete

D. Section 03 60 00 - Grouting

E. Section 31 23 19 - Dewatering

F. Section 31 23 16 - Structural Excavation and Backfill

G. Section 31 23 33 - Trenching and Backfilling

1.3 REFERENCE STANDARDS

A. Conform the Work for this Section, unless otherwise specified, to the applicable portions of the following Standard Specifications:

1. AASHTO M 36: Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains
2. AASHTO M 167M/M 167: Standard Specification for Corrugated Steel Structural Plate, Zinc-Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches
3. AASHTO M 196: Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
4. AASHTO M 245: Standard Specification for Corrugated Steel Pipe, Polymer-Precoated, for Sewers and Drains
5. AASHTO M 252: Standard Specification for Corrugated Polyethylene Drainage Pipe
6. AASHTO M 274: Standard Specification for Steel Sheet, Aluminum-Coated (Type 2), for Corrugated Steel Pipe
7. AASHTO M 278: Standard Specification for Class PS46 Poly(Vinyl Chloride) (PVC) Pipe
8. AASHTO M 330: Standard Specification for Polypropylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter
9. ASTM A48/A48M: Standard Specification for Gray Iron Castings
10. ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

11. ASTM A1064/A1064M: Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
12. ASTM C12: Standard Practice for Installing Vitrified Clay Pipe Lines
13. ASTM C14: Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe
14. ASTM C55: Standard Specification for Concrete Building Brick
15. ASTM C76: Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
16. ASTM C139: Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes
17. ASTM C150/C150M: Standard Specification for Portland Cement
18. ASTM C361: Standard Specification for Reinforced Concrete Low-Head Pressure Pipe
19. ASTM C425: Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings
20. ASTM C443: Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
21. ASTM C478/C478M: Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
22. ASTM C507: Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe
23. ASTM C700: Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
24. ASTM C877: Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections
25. ASTM C990: Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
26. ASTM C1433: Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
27. ASTM C1577: Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers Designed According to AASHTO LRFD
28. ASTM D3212: Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
29. ASTM D4101: Standard Classification System and Basis for Specification for Polypropylene Injection and Extrusion Materials
30. ASTM F477: Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

31. ASTM F949: Standard Specification for Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings
32. ASTM F2881/F2881M: Standard Specification for 12 to 60 in. [300 to 1500 mm] Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications
33. American Concrete Pipe Association (ACPA)
34. Michigan Department of Transportation, Standard Specifications for Construction, latest edition (MDOT)

1.4 SOURCE QUALITY CONTROL

A. Laboratory test not less than one (1) percent, with a minimum of three (3) pieces each size, material and class of gravity pipe required in the Work.

1.5 SUBMITTALS

A. Submit a complete field report of the location of all wye openings and sump pump discharge leads to the Landscape Architect at the end of each sewer section of the Project or on the last day of each week, whichever occurs first.

B. Submit two (2) copies of the laboratory test reports required per Part 1, Source Quality Control, of this Section to the Landscape Architect.

C. Submit complete Shop Drawings for all manhole tees to the Landscape Architect.

D. Submit shop drawings and design information for all precast concrete box sections.

1.6 STORAGE OF MATERIALS

A. Do not stack piping material higher than 4 feet or the manufacturer's recommended height, whichever is lower. Provide suitable racks, chairs, and other supports to protect preformed pipe mating surfaces from damage. Store bottom tiers off the ground, alternate tiers, and chock tier ends.

B. Protect jointing and sealing materials used in the storm sewer system from sunlight and store them in as cool and clean a place as practicable until ready for application.

1.7 HANDLING OF MATERIAL

A. Load and unload materials using suitable approved equipment. Prevent materials from being dropped, bumped, or allowed to impact against themselves. Reject damaged material as determined by the Landscape Architect.

B. Use lifting devices suited to the Work and designed to protect surfaces from damage.

PART 2 PRODUCTS

2.1 MATERIALS

A. It is the intent of the Articles in Part 2 of this specification section is to specify in detail the various types of sewer pipe, joints, manholes, etc. which have been indicated throughout the Plans and Specifications. Do not construe these Articles as permitting any alternate type of material other than what is indicated on the Plans or elsewhere in the Specifications.

2.2 CLAY PIPE

A. Use clay pipe conforming to ASTM C700, extra strength vitrified clay pipe.

B. Use premium compression type joints conforming to ASTM C425.

C. When not specified, make joints with cold applied pipe joint sealer. Refer to Part 2 of this Section for requirements for cold applied pipe joint sealer.

2.3 NONREINFORCED CONCRETE PIPE SYSTEMS

A. Use pipe conforming to ASTM C14, Class III nonreinforced concrete sewer pipe.

B. When not specified, make pipe joints with cold applied pipe joint sealer. Refer to Part 2 of this Section for requirements for joints.

2.4 REINFORCED CONCRETE PIPE

A. Use reinforced concrete pipe conforming to ASTM C76. Use pipe sizes 12 to 30 inch diameter as Class II thru V, Wall B or Wall C, circular reinforced. Use pipe sizes 36 to 108 inch diameter as Class I through V, Wall B or Wall C, circular reinforced or elliptical reinforced.

B. Use the following method of indexing the steel and pipe barrel when elliptical reinforcement is used.

1. Set a dummy lift pin form in the outer pipe wall form, projecting into the pipe wall a minimum of 1-3/4 inch and a maximum of . Weld an additional spacer chair to the elliptical steel cage at the proper location to engage the dummy lift pin form during the pipe casting operation.

2. It is the intent of the spacer chair and dummy lift pin arrangement to provide a means of assuring the final position of the elliptical steel cage within the barrel of the pipe and, further, for providing a means of indexing the pipe in the field to assume proper placement of the pipe.

3. Stripe elliptically reinforced pipe along the inside top with a minimum 1 inch wide indelible marker prior to shipment to allow final inspection of pipe orientation after installation.

C. Submit design information for circular pipe 114 inch or larger in diameter to the Landscape Architect for approval prior to fabrication, in accordance with Section 6 of ASTM C76.

D. Design all pipes to meet the d-load requirements for the class of pipe indicated on the Plans.

E. Make pipe joints with cold applied pipe joint sealer when not specified otherwise.

2.5 REINFORCED CONCRETE ELLIPTICAL PIPE

A. Conform reinforced concrete elliptical pipe to ASTM C507.

B. Make pipe joints with cold applied pipe joint sealer when not specified otherwise.

2.6 PRECAST CONCRETE BOX SECTION

A. Ensure precast concrete box sections meet ASTM C1433, ASTM C1577, or ACPA "Boxcar" requirements. Use the same design conditions existing at construction time or planned for future development unless specified otherwise.

2.7 JOINTS FOR CONCRETE OR CLAY PIPE, BOX SECTIONS AND MANHOLES

A. Sealed Joints (Cold Applied Pipe Joint Sealer):

1. Make pipe joints with cold applied pipe joint sealer when not specified otherwise.
2. Conform cold-applied pipe joint sealer to MDOT Section 909.09. Use bituminous material with a consistency that allows spreading on joints with a trowel when the air temperature ranges between 20 and 100 degrees F.
3. Ensure the bituminous material adheres to the pipe to create a watertight seal and does not flow, crack, or become brittle when exposed to the atmosphere.

B. Premium Joints:

1. Conform premium joints for circular pipe to ASTM C443 with the following limitations: Replace Section 5.1 of ASTM C443, "Physical Requirements for Gaskets," with Section 6.9 of ASTM C361, "Rubber Gaskets." Limit Section 5 of ASTM C443 to a modified grooved tongue designed to receive a rubber gasket.
2. Conform premium joints for elliptical pipe to ASTM C877, external sealing bands for non-circular concrete pipe.
    a. Ensure the width of the sealing bands is at least equal to twice the depth of the groove. For modified bell tongue and groove pipe, use the next larger gasket.
    b. Set the length of the sealing bands equal to the outside circumference of the pipe at its largest diameter plus an amount equal to the width of the gasket to be used.
3. Use only lubricant supplied by the pipe manufacturer on the groove and tongue when making joints. Couple the joints in accordance with the pipe manufacturer's requirements.

C. Preformed Flexible Joint Sealant:

1. Butyl Rubber Sealant complying with ASTM C990.

D. Fill the inside annular space of all concrete pipe 36 inch diameter (or equivalent) and larger with cement mortar and trowel flush. Mix the mortar using 1 part Portland cement and 2 parts plaster sand. Use only enough water for "dry packing" when mixing mortar for inside joints.

2.8 CORRUGATED METAL PIPE

A. Galvanized Corrugated Metal Pipe:

1. Conform corrugated galvanized steel pipe with circular cross section and pipe-arch shape to the requirements of AASHTO M 36 and MDOT Section 909.05.
2. Reroll a minimum of two (2) circumferential corrugations on each end of each section of helical corrugated pipe.

B. Polymeric Coated Corrugated Galvanized Steel Pipe:

1. Conform polymeric coated corrugated galvanized steel pipe with circular cross section and pipe-arch shape to the requirements of AASHTO M245 and MDOT Section 909.05.
2. Ensure the helical corrugated pipe has a minimum of two (2) circumferential corrugations re-rolled on each end of each pipe section.

C. Aluminized Type 2 Corrugated Metal Pipe:

1. Conform Type 2 aluminized corrugated steel pipe with circular cross section and corrugated steel pipe with pipe-arch shape to the requirements of AASHTO M 36, AASHTO M 274, Type 2, and MDOT Section 909.05 specifications.
2. Provide a minimum of two (2) circumferential corrugations re-rolled on each end of each helical corrugated pipe section.

D. Corrugated Aluminum Alloy Pipe:

1. Conform corrugated aluminum alloy pipe with circular cross section and corrugated aluminum alloy pipe with arch-pipe shape to the requirements of AASHTO M196 and MDOT Section 909.05.

E. Joints for Corrugated Metal Pipe:

1. Make joints for corrugated metal pipe using coupling bands. Use coupling bands made of the same material specified for the pipe and prevent infiltration of the side fill material.
    a. Corrugate coupling bands to match the pipe's corrugations and include two (2) "O" ring neoprene gaskets for each joint. Do not use dimple bands.
    b. Wrap all joints with a 3 foot wide geotextile filter fabric centered on the joint.
2. Use bell and spigot coupling system with rubber gasketed joints when called for in the Contract Documents.

2.9 DUAL WALL CORRUGATED PVC PIPE – SMOOTH INTERIOR

A. Provide pipe as a single extrusion of PVC with smooth interior and corrugated outer walls. Ensure the corrugated outer profile is annular and seamless.

B. Provide pipe and fittings in accordance with ASTM F949. Use bell and spigot type joints with elastomeric gasket meeting ASTM F477 requirements and suitable for storm sewer service.

C. Provide molded wye or tee fittings per ASTM F949, with gasketed joints on each end suitable for direct insertion into the mainline pipe. Use branch connection fittings with gasketed joints suitable for the specified house lead pipe. Do not allow saddle connections.

D. Acceptable manufacturers of Dual wall corrugated pipe include Contech A2000, Uponor ETI Ultra-Corr or Landscape Architect approved equal.

2.10 CORRUGATED POLYETHYLENE PIPE

A. Smooth-Lined Corrugated Polyethylene Pipe:

1. Meet the requirements of MDOT section 909.06 and AASHTO M 252, Type S for smooth lined corrugated polyethylene pipe sized 4 to 10 inch diameter, and AASHTO M 294, Type S for 12 to 48 inch diameter.
2. Conform fittings to the corresponding pipe specification and construct them from the same material classification as the pipe. Weld fittings on the interior and exterior at all junctions.
3. Use bell & spigot type joints with rubber gaskets on both sides conforming to MDOT section 909.03 and ASTM F477. Do not allow split collar couplers. Ensure joints are watertight and meet ASTM D3212 performance requirements.

B. Corrugated Plastic Edge Drain / Underdrains.

1. Corrugated plastic tubing for edge drains or underdrains must meet the requirements of AASHTO M 252 for polyethylene tubing. Wrap pipe in a Geotextile Pipe Wrap per MDOT Section 910.03.A.

2.11 SMOOTH PLASTIC PIPE

A. Use polyvinyl chloride (PVC) smooth plastic pipe for underdrains meeting AASHTO M 278 requirements. Wrap pipe in a Geotextile Pipe Wrap per MDOT Section 910.03.A.

2.12 DUAL WALL CORRUGATE POLYPROPYLENE PIPING

A. Provide Dual Wall Corrugate Polypropylene Pipe with smooth interior and annular exterior corrugations. Ensure pipe sized 12 through 60 inch diameter meets ASTM F2881/F2881M or AASHTO M 330 requirements.

B. Use impact modified copolymer polypropylene compound for pipe and fitting production that meets material requirements of ASTM F2881, Section 5, and AASHTO M 330, Section 6.1.

C. Join pipe using a bell & spigot joint meeting ASTM F2881/F2881M or AASHTO M 330 requirements. Ensure the joint is watertight according to ASTM D3212 requirements.

D. Meet gasket requirements of ASTM F477. Install gasket by the pipe manufacturer and cover it with a removable, protective wrap to keep the gasket free from debris. Use a manufacturer-approved joint lubricant on the gasket and bell during assembly.

E. Fittings

1. Conform fittings to ASTM F2881/F2881M or AASHTO M 330. Use bell and spigot connections with welded or integral bell and valley or inline gaskets meeting ASTM D3212 watertight joint performance requirements.

2.13 STRUCTURAL PLATES FOR FIELD ASSEMBLY OF PIPE, PIPE-ARCHES, AND ARCHES

A. Use plates, bolts, and nuts for field assembled circular pipe, pipe-arches, and arches that meet all applicable requirements of AASHTO M 167M/M 167 and MDOT Section 909 specifications.

2.14 END SECTIONS

A. Conform precast concrete end section to ASTM C76, Class II, and MDOT Section 909.04 specifications. Use a standard tongue and groove joint with cold-applied pipe joint sealer for connection to pipe. Refer to Part 2 of this Section for cold-applied pipe joint sealer requirements.

B. Conform metal end sections to MDOT 909.05. Refer to Part 2 "Corrugated Metal Pipe" for joint requirements for end sections.

2.15 STORM STRUCTURES

A. Conform materials for storm sewer structures to the requirements indicated on the Plans and specified below.

B. Concrete Brick:

1. Provide concrete brick as ASTM C55, Grade S-II, solid units with nominal 3 inch thickness.

C. Concrete Block:

1. Conform block to ASTM C139, manufactured of Portland cement meeting ASTM C150/C150M, Type II. Use solid curved blocks with inside and outside surfaces parallel and curved to required radii. Provide blocks with a groove or other approved joint type at the ends.

a. Shape blocks intended for use in cones or tops of manholes as required to form the structure indicated on the Plans.

D. Precast Concrete:

1. Conform precast concrete manhole flat top slabs, risers, cones, bases, grade rings, transition sections, and bottom sections to ASTM C478/C478M. Ensure all are circular with circular reinforcement.

a. Design manhole for earth loading at the design bury depth with a factor of safety of 1.5 for depths greater than 32 feet.

2. Provide base slab with minimum thickness of 8 inches thick for depths up to 25 feet and minimum thickness of 12 inches thick for depths greater than 25 feet.

3. Design transition sections, reducers, and flat top slabs for earth loading at the design bury depth with a factor of safety of 1.5.

4. Conform precast concrete manhole tee units to ASTM C76, Class IV. Ensure units are circular with circular reinforcement. Provide Shop Drawings for all manhole tees.

5. Use joints on the precast manhole tee identical to those on the storm sewer section.

E. Manhole Steps:

1. Conform cast iron manhole steps to ASTM A48/A48M, Class 30, gray iron. Provide steps with a minimum cross section dimension of 1 inch in any direction.

2. Use steel reinforced plastic steps made of suitably approved co-polymer polypropylene conforming to ASTM D4101, PP0344B33534Z02, with 1/2

inch minimum diameter deformed reinforcing bar conforming to ASTM A615/A615M, Grade 60.

3. Provide manhole steps of the type and size indicated on the Plans. Comply with applicable occupational safety and health standards. Install manhole steps at locations indicated on the Plans.

F. Frames and Covers:

1. Conform frames and covers for manholes, catch basins, and inlets to ASTM A48/A48M, Class 30, gray iron. Provide castings of the types and sizes indicated on the Plans. Ensure castings are neatly made and free from cracks, holes, and other defects.

2. Grind surfaces of casting to ensure proper fit and prevent rocking.

2.16 CONCRETE

A. Conform concrete to MDOT Section 1004. Use 3,500 psi strength concrete; Type IA cement; MDOT 6A coarse aggregate; MDOT 2NS fine aggregate; 3 inch maximum slump; no admixtures without the Landscape Architect's approval.

2.17 CONCRETE REINFORCEMENT

A. In accordance with MDOT Section 905, use ASTM A615/A615M, Grade 60 for bars and ASTM ASTM A1064/A1064M for welded wire fabric.

EXECUTION

3.1 VERIFICATION OF EXCAVATION AND BEDDING

A. Prior to the installation of any storm sewer piping, structures, or materials, examine all trenches and other excavations for the proper grades, lines, levels and clearances required to receive the new Work.

B. Ascertain that all excavation bottoms, compacted subgrades and pipe bedding are adequate to receive the storm sewer materials to be installed.

C. Correct all defects and deficiencies before proceeding with the Work.

3.2 EXISTING STORM SEWERS AND DRAINS

A. Expose the existing storm sewer and structures designated for connection with the new Work and notify the Landscape Architect. Allow the Landscape Architect to verify the vertical and horizontal locations of the existing system and provide necessary adjustment instructions to align the new storm sewer Work with the existing system.

3.3 PREPARATION

A. Clean the outside surface of the spigot end and the inside surface of the bell end of the pipe, ensuring they are free of any foreign materials other than the manufacturer-recommended sealant, prior to installation.

B. Examine pipe, frames, covers, accessories, and appurtenances carefully for damage and other defects immediately before installation. Reject and remove defective or damaged material from the Project.

3.4 INSTALLATION - GENERAL

A. Ensure each section of pipe, when placed to grade and line, has firm bearing on the trench bedding throughout its length.

B. Use approved tools and methods suitable for the pipe material to cut pipe. Employ cutting methods that produce a smooth, square-cut end without damaging the pipe and that minimize airborne particles.

1. Perform pipe cutting using the manufacturer's recommendations for the specific pipe material and follow best trade practices.

2. Take care to prevent damage to the interior and exterior surfaces when cutting pipe. Reject a complete pipe section if either surface is damaged.

C. Keep the trench free of water during pipe bedding preparation and until satisfactory backfilling. Provide and maintain a dewatering system per Section 31 23 19. Keep the dewatering system operational until the trench is backfilled.

D. Use backfill as indicated on the Plans and specified in Section 31 23 33.

3.5 PIPE LAYING

A. Install pipe in conformance with ASTM C12 and manufacturer recommendations.

B. Protect the pipe during handling against impact shocks and free fall. Prevent hooks from contacting premolded joint surfaces.

C. Handle pipes with premolded joint rings or attached couplings so that no weight, including the pipe's own weight, bears on or is supported by the jointing material.

D. Avoid dragging any pipe on the ground or allowing damage from contact with gravel, crushed stone, or other hard objects.

E. Lay pipe to the line and grade specified on the Plans. Check each laid pipe with a line and grade pole or laser system to ensure accuracy. When using a laser system, provide an independent and alternate method for checking line and grade.

F. Begin construction at the outlet end and proceed upgrade with spigot ends pointing in the flow direction. Excavate bell holes to ensure the full barrel length bears uniformly on the bedding material.

G. Use lubricants, primers, or adhesives recommended by the pipe or joint manufacturer immediately before jointing.

H. Center the pipe in the bells or grooves and push tight together to form a smooth, continuous invert. After laying, avoid disturbing the pipe's line and grade. Re-lay any pipe found off grade or out of line properly.

I. Use mechanical means to pull home all pipe where manual methods cannot push and hold the pipe in place. Employ a cable placed inside the pipe with a suitable winch, jack, or come-along to pull the pipe home and hold it in position.

J. Install circular concrete pipe with elliptical reinforcement so that lift holes face the top of the pipe. Align the manufacturer's marks designating the top and bottom within five

degrees of the vertical plane through the pipe's longitudinal axis. After installation, seal lift holes with suitable concrete plugs.

K. Install Type HE elliptical pipe with the longer axis placed horizontally within a ± five-degree tolerance.

L. Install Type VE elliptical pipe with the longer axis placed vertically within a ± five-degree tolerance.

M. Ensure the finished work is straight and sight it through between manholes.

3.6 PIPE BEDDING

A. After excavating the bottom of the trench, install pipe bedding material per Section 31 23 33. Then install the pipe strictly following the manufacturer's recommendations.

B. After laying the pipe, continue bedding above the pipe as specified in Section 31 23 33. Take particular care to fill and tamp all spaces under, around, and above the top of the pipe.

C. Provide continuous and uniform bedding in the trench for all buried pipe as specified in Section 31 23 33.

3.7 UNDERDRAINS

A. Lay the pipe in close conformity with the lines or grades shown on the Plans or established by the Landscape Architect.

B. Close the upgrade ends of all underdrains with suitable plugs to prevent entry of soil or other foreign material.

C. Lay perforated pipe with the perforations down.

D. Bed underdrains in MDOT open graded drainage course material. Provide bedding with a minimum thickness of 6 inches beneath the pipe, a minimum width of 6 inches on each side, and extend to at least 12 inches above the top of the pipe.

E. Place bedding equally on both sides of the underdrain simultaneously. Use staking or other restraint methods during backfilling to maintain the underdrain's line and grade.

F. Rodent screens and outlet endings are required for all underdrains which terminate in a ditch or swale.

3.8 STORM STRUCTURES

A. Construct storm sewer manholes, catch basins, inlets, and other structures to the grades, lines, and levels indicated on the Plans and as specified. Complete structures with concrete bases, reinforcing, frames, covers, adjustment bricks, and other components shown or required for a complete installation.

B. Use storm sewer structures conforming to the type of material and dimensions indicated on the Plans.

C. Construct cast-in-place structures in accordance with Section 03 30 00.

D. Block Structures:

1. Construct concrete block structures at the locations and according to the details shown on the Plans. Place the first course of concrete blocks on the prepared base or footings in a full bed of mortar.
2. Provide full and close mortar joints in all courses. Keep courses level throughout. Stagger joints in adjoining courses by approximately one-half the block length. Maintain uniform joint thickness throughout the structures.
3. Strike all joints and properly point to provide true, smooth surfaces.
4. Apply a 1/2 inch thick cement mortar plaster coat to the exterior surfaces of the brick and block sections of all storm structures as indicated on the Plans.

E. Precast Concrete Structures:

1. Construct precast concrete structures as detailed on the Plans. Provide mortar joints struck smooth. Provide three (3) to five (5) courses of 8 inch brick or concrete grade rings at top of structure for future adjustment of castings.

F. Provide and install all frames and covers to the elevations indicated on the Plans. Set castings in a full bed of cement mortar at least 1/2 inch thick. Strike mortar joints smooth.

G. Install steps at the plant by the manufacturer for precast units. Field install steps for brick, block, or cast-in-place structures according to the types and locations indicated on the Plans.

H. Connect pipe up to 42 inches in diameter to storm structures using a grouted joint as indicated on the Plans. Support the pipe properly to prevent settlement from disturbing the connection.

I. Install pipe of in diameter or larger as an integral part of the manhole (manhole tees), constructed of 3500 pdi concrete and reinforcing as indicated on the Plans.

J. Use manhole tees for pipe 42 inches in diameter or larger as indicated on the Plans. Connect manhole tees using tees and pipe with the same type of joint. Support the pipe and tee properly with concrete as indicated on the Plans.

K. Provide sump in all catch basins and storm manholes with outlets of 18 inches in diameter or less, as indicated on the Plans.

L. Construct flow channels in all structures not requiring a sump, as indicated on the Plans.

3.9 FIELD QUALITY CONTROL

A. After laying, constructing, and backfilling all pipe and structures, perform the final inspection. Prepare the sewer system for final inspection within two (2) weeks after completing each 2,000 feet section of sewer installed.

B. Conduct the final inspection with a visible and audible check of the sewers and structures to confirm that steps are placed, all lift holes are filled, manhole bottom channeling is complete, all visible or audible leaks are stopped, pipe is laid straight and true to proper slopes and elevations, required brick courses for adjustment are placed, frame and cover are properly installed, required end section is installed, trenches and

structures are backfilled in a workmanlike manner, and the system is thoroughly cleaned.

C. Consider the final inspection complete when all repairs have been made.

3.10 DEFLECTION TEST FOR PLASTIC PIPE

A. Test plastic pipe for deflection no sooner than 30 days after backfilling the pipe.

B. Limit maximum allowable deflection (reduction in vertical inside diameter) to five (5) percent.

C. Excavate and repair locations with excessive deflection by re-bedding and/or replacing the pipe.

D. Use optional devices for testing, including a deflectometer, calibrated television or photography, or a properly sized "go, no-go" mandrel or sewer ball. Provide a mandrel with a minimum of nine (9) legs.

3.11 REMOVE STORM SEWER

A. Excavate and remove the existing storm sewer where indicated on the plans. Bulkhead the opening in storm sewers or structures where the existing storm sewer has been removed.

B. Where removal of existing storm sewer is occurring in essentially the same location as a new sewer or structure, the removal of the existing sewer is incidental to the project, unless otherwise indicated in the Proposal.

3.12 REMOVE CULVERTS

A. Excavate and remove culverts where indicated on the plans. Backfill the completed work as specified under “Backfilling Trenches” in Section 31 23 33.

3.13 REMOVE STRUCTURE

A. Excavate and remove structures where indicated on the plans. Bulkhead the ends of any sewers remaining in place. Backfill the completed work as specified under “Backfilling Trenches” in Section 31 23 33.

B. Removal of existing storm structures is incidental to the project if a new structure or sewer is being constructed in essentially the same location; unless otherwise indicated in the Proposal.

3.14 REMOVE AND REPLACE STORM SEWER

A. Remove and dispose of the existing storm sewer completely and replace it with the size and type specified on the plans or in the specifications.

B. Follow the materials and installation requirements of this section and Section 31 23 33, as applicable.

3.15 REMOVE AND REPLACE STORM STRUCTURE

A. Remove and dispose of the existing storm structure completely and replace it with the size and type specified on the plans or in the specifications.

B. Follow the materials and installation requirements of this section and Section 31 23 33, as applicable.

END OF SECTION

SECTION 33 44 00
STORM UTILITY WATER DRAINS

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section includes open drain construction complete with excavation and disposal of excavated material, backfilling and grading of abandoned open drains, maintaining overland drainage and cleanout of existing open and enclosed drains.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 57 13 - Temporary Erosion and Sediment Control

C. Section 01 89 00 - Site Construction Performance Requirements

D. Section 31 11 00 - Clearing and Grubbing

E. Section 31 22 00 - Grading

F. Section 31 23 16 - Structural Excavation and Backfill

G. Section 31 23 19 - Dewatering

H. Section 31 35 00 - Slope Protection

I. Section 32 92 19 - Seeding

J. Section 32 92 23 - Sodding

K. Section 33 41 00 - Storm Utility Drainage Piping

1.3 ALLOWABLE TOLERANCES

A. Trim and dress all excavation areas to conform to the lines, grades, and cross sections shown on the Plans within the following tolerances:

1. Maintain the finished surface elevation of all channel bottoms within ±1 inch of the Plan elevation.

2. Maintain the finished surface elevation of all channel areas, other than channel bottoms, within ±2 inches of the Plan elevation.

1.4 JOB CONDITIONS

A. Carefully protect trees, shrubs, and other vegetation outside the Work limits designated on the Plans or by the Landscape Architect from damage or injury throughout the entire drain construction operation.

B. Replace trees, shrubs, or other vegetation damaged by the Contractor's operation but not designated for removal. Include all costs incurred as incidental to the open drain construction operation.

C. Carefully protect existing buildings, fences, culverts, drain tile, utility poles, overhead lines, underground conduits, underground cables, sewers, structures, and other

improvements within the drain right-of-way limits not designated for removal on the Plans from damage during the drain construction operation.

D. Repair or replace any existing structure or improvement not designated for removal that sustains damage from the Contractor's operation. Include all costs incurred as incidental to the drain construction operation.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 PERFORMANCE – GENERAL

A. Begin construction at the outlet end of the open drain and proceed upstream, unless the Landscape Architect authorizes otherwise.

B. Keep the drain free of water prior to excavation or cleanout and until satisfactory completion of the open drain construction. Provide and maintain a dewatering system as specified in Section 31 23 19 - Dewatering.

3.2 DISPOSAL AREAS

A. Furnish and maintain a disposal area at personal expense if disposal areas for unsuitable materials are not specified on the Plans. Do not use spoil disposal areas designated on the Plans for unsuitable materials unless otherwise specified or determined by the Landscape Architect.

3.3 CLEARING AND GRUBBING

A. Clear and grub the drain right-of-way and spoil deposit areas, designated on the Plans or determined by the Landscape Architect, prior to the actual excavation of the open drain as provided in Section 31 11 00 - Clearing and Grubbing.

B. Perform the clearing and grubbing work along the open drain at least 1/2 mile before the excavation operation.

C. Prepare the area for excavation or fill by removing unsuitable materials and vegetation that interfere with the proposed work. Preserve all material ground cover, trees, other vegetation, and improvements designated to remain from injury or defacement.

D. Consider the clearing and grubbing operations, including removal and disposal of unsuitable materials, incidental to the Project and part of the excavation pay item.

3.4 REMOVING AND SALVAGING TOPSOIL

A. Salvage topsoil in an amount equivalent to the quantity required for the Work specified on the Plans or as designated by the Landscape Architect.

B. Topsoil in excess of the required amount, will be disposed of at the Contractor's expense.

C. When additional topsoil is required to complete the drain construction operation, furnish, place, and spread the additional topsoil at the Contractor’s expense.

D. Cut all vegetation to a height of approximately 2 inches, and ensure the topsoil is free of foreign materials prior to removal. Remove topsoil in a manner that avoids lifting subsoils.

E. Remove topsoil within the grading limits for cuts, to the width and depth specified on the Plans or as directed by the Landscape Architect.

F. Stockpile topsoil within the drain right-of-way, outside of the construction area. Keep topsoil separate from other excavated materials to be used for embankments or disposal. Place the topsoil as near the original location as possible, as no payment will be made for overhauls. Select stockpile locations that avoid placing material around tree trunks or over root systems of trees to be preserved.

G. Consider the cost of topsoil removal, stockpiling, hauling, spreading, and grading as incidental to the Project.

3.5 EXCAVATION

A. Excavate the open drain to the lines, grades, dimensions, and cross sections specified on the Plans.

B. Remove and dispose of all materials necessary to construct the open drain. Place the removed material in suitably prepared spoil disposal areas. If the Plans do not specify spoil disposal areas, provide and maintain a disposal area at the Contractor’s expense.

C. Perform construction, excavation, and disposal operations in a manner and sequence that maintains adequate drainage at all times.

D. Immediately cease operations and notify the Landscape Architect when wet or unstable soil conditions are encountered during excavation. With the Landscape Architect’s approval, make changes in the Work, in addition to dewatering, to facilitate soil dewatering and stabilization. Cover costs incurred for dewatering and stabilizing soils at the Contractor's expense.

E. Excavate a pilot channel at least 30 days before completing final drain side slopes when indicated on the Plans or when encountering wet or unstable soils. Let the Landscape Architect determine when drain slopes have stabilized sufficiently to allow final slope shaping.

1. Excavate the pilot channel with a bottom width approximately one-half the proposed final width and 1:1 side slopes, to the elevations indicated on the Plans. Do not excavate the pilot channel upstream from any bridge requiring protection work or replacement until the scheduled bridge work is completed, unless approved otherwise by the Landscape Architect.

F. Remove and dispose of stones, boulders, or rocks encountered during excavation as unsuitable material. Backfill and compact any holes or voids created below plan grade after removal with approved materials, to the Landscape Architect’s satisfaction.

G. Cover costs incurred for removal and disposal of stones, boulders, and rocks, as well as backfilling and compaction, at the Contractor's expense.

H. Immediately cease operations and notify the Landscape Architect upon encountering ledge rock.

I. Blasting will not be permitted unless otherwise specified on the Plans or approved by the Landscape Architect.

3.6 GRADING REQUIREMENTS

A. Excavate channel areas receiving slope protection to a depth sufficient for installing protective materials and meeting finished surface grade tolerances.

B. Consider the additional excavation necessary for slope protection incidental to the Project cost.

C. Backfill and compact areas of over excavation with approved materials at the Contractor's expense.

D. Finish grades in a condition satisfactory to the Landscape Architect immediately before placing slope protective materials.

E. Trimming and finishing the earth grade will be considered incidental to the excavation.

3.7 SOIL EROSION AND SEDIMENTATION CONTROL

A. Provide, maintain, and remove temporary and/or permanent soil erosion and sedimentation control measures specified on the Plans or determined by the Landscape Architect, at the Contractor’s expense.

B. Prevent surface runoff from carrying excavated materials into the drain, reduce erosion of slopes, and prevent silting in of the drain downstream of the Work using the measures.

C. The measures should include provisions to reduce erosions by the wind of all areas stripped of vegetation, including material stockpiles.

D. Comply with requirements of Section 01 57 13 - Temporary Erosion and Sediment Control.

3.8 SLOPE STABILIZATION

A. After completing the grading operation and before placing any protective covering, have the Landscape Architect inspect the slopes for signs of internal water movement, such as seepage and soil slippage, and for unstable slope conditions.

B. Take necessary measures to stabilize slopes, including removing and disposing of unsuitable or unstable materials, backfilling with approved material, and compacting. Consider costs incurred for slope stabilization incidental to excavation.

3.9 SPOIL DISPOSAL AREAS

A. Deposit excavation free from unsuitable materials in approved spoil disposal areas, as specified in Section 01 89 00 - Site Construction Performance Requirements.

B. Prohibit depositing spoil materials in existing watercourses or drains unless otherwise specified on the Plans. Deposit, compact, and grade spoil material to provide drainage. Construct swales when necessary to ensure positive drainage to the drain.

3.10 CULVERTS

A. Install new culverts or culverts to be relayed as indicated on the Plans, following Section 33 41 00 - Storm Utility Drainage Piping. Take special care when removing, salvaging, storing, handling, or placing culverts to prevent damage.

B. Only culverts meeting the approval of the Landscape Architect may be relayed.

C. Repair any culverts with scraped or otherwise damaged protective coating to the Landscape Architect's satisfaction at the Contractor's expense.

D. Corrugated steel pipe, when specified, will be laid with the outside laps of circumferential joints pointing upstream and with longitudinal laps at the sides at about the vertical mid-height of the culvert.

E. Rotate the inverts 180 degrees when relaying existing culverts.

F. Make arrangements with the landowner and/or land user for the removal of culverts. Provide the Landscape Architect with a copy of the arrangements made, bearing the signature of the landowner and/or land user.

G. Dispose of any culvert removed and not relayed at the Contractor's expense.

H. Relay culverts specified for removal and relaying at the culvert crossing from which they were removed. Do not use salvaged culverts at any other location unless authorized by the Landscape Architect.

3.11 TILE OUTLETS

A. Contact existing landowners and land users to locate and flag all field tile outlets to be protected during excavation. Do not proceed with the Work until marking of tile outlet locations is complete.

B. The Contractor will be responsible for leaving the tile outlets in good repair and in working order.

C. Shorten the length of existing field tile outlets and recess them into the newly shaped slope when necessary. Consider this Work incidental to the Project.

D. Install new outlets as called for on the Plans, using specified materials. Furnish and place a suitable rodent guard on the end of each new outlet at the Contractor's expense. Relocate existing rodent guards as incidental to the Project.

E. When it is apparent a field tile outlet is carrying human or animal waste material from a home or barnyard area, the Contractor will request the County Health Department approval before reconnecting the outlet to the drain.

3.12 BRIDGES

A. Remove and dispose of existing bridges or remove, salvage, and reinstall them as specified on the Plans. Take care when removing, salvaging, storing, handling, and reinstalling the existing bridge.

B. Make arrangements with the landowner and/or land user for the removal of the bridge. Provide the Landscape Architect with a copy of the arrangements made, bearing the signature of the landowner and/or land user.

3.13 CLEANOUT OF DRAIN

A. Include clearing and grubbing of all trees, brush, stumps, and other vegetation in the cleanout of the existing drain, following Section 31 11 00 - Clearing and Grubbing. Perform excavation according to Part 3 of this Section.

B. Completely remove and dispose of all sediment, silt, dirt, debris, and other miscellaneous items to the bottom of the culvert, the elevation shown on the Plans, or as determined by the Landscape Architect during enclosed drain cleanout.

C. Restore all disturbed areas with topsoil, seed, fertilizer, and mulch or with topsoil and sod upon completion of the cleanout.

END OF SECTION