CONTRACT DOCUMENTS

SCULPTURE PARK AND GARDEN

The Jefferson Project
409 1st Street, Bay City, MI 48708

February 2026

One Tampa City Center, 201 N Franklin St Suite 1350, Tampa, FL 33602

TJP200101M

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The Plans bearing the general title of Sculpture Park and Garden and dated February 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

Sculpture Park and Garden

Sealed Bids will be received by The Jefferson Project at their main offices, 409 1st Street, Bay City, MI 48708, until 3:00 PM, Local Time, 03-06-2026, at which time and place said Bids will be opened and publicly read aloud.

After the bid closing time, Bids will be reviewed and publicly read aloud at the The Jefferson Project, main office, 409 1st Street, Bay City, MI 48708.

Bids will be received for the following Work:

Art-themed public space featuring sweeping concrete sidewalks and an amphitheater space with landscape planters and a variety of sculpture areas and related furnishings and equipment.

Contract Documents may be examined at the following locations:

The Jefferson Project, 409 1st Street, Bay City, MI 48708

Builders Exchange of Lansing and Central Michigan, 1240 E. Saginaw Street, Lansing, MI 48906

Wade Trim, 1403 S Valley Center Dr, Bay City, MI 48706

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/

A. Documents downloaded from our website will bear a watermark on various signature pages and will be considered unofficial copies for bidding purposes; copies obtained from anywhere other than Wade Trim will be considered unofficial copies and will not be considered a responsible bid.

Each Bid will be accompanied by a bid bond, in the amount of at least **five (5)** percent of the amount bid, drawn payable to The Jefferson Project as security for the proper execution of the Agreement.

A non-mandatory pre-bid conference will be held on 02-26-2026 at 11:00 AM, Local Time. It is a requirement for any prospective Contractor bidding to attend this non-mandatory meeting. Representatives of the The Jefferson Project and the Project Manager will be present to discuss the project. Attendance is not required for Bidders to be considered responsive.

The pre-bid conference will be held remotely on Microsoft Teams.

Join: https://teams.microsoft.com/meet/29579301563512?p=NjXdlRdSYRcNzD6IlR

Meeting ID: 295 793 015 635 12

Passcode: 5cq38wc7

The Jefferson Project 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.

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

Inquiries will be directed to Christopher Thompson, Project Manager at Phone: (813) 921-9926 or email: cthompson@wadetrim.com.

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 The Jefferson Project 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 The Jefferson Project makes an award.

D. The term "The Jefferson Project" means The Jefferson Project, 409 1st Street, Bay City, MI 48708, a Municipal Corporation and being a party of the first part of this Contract.

E. The term “Landscape Architect” means Wade Trim, 1403 S Valley Center Dr, Bay City, MI 48706, 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 The Jefferson Project in determining the responsibility of any Bidder, the Bidder, within 48 hours after being requested in writing by the The Jefferson Project to do so, must furnish evidence, satisfactory to the The Jefferson Project, 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 The Jefferson Project 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 The Jefferson Project 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 The Jefferson Project 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 The Jefferson Project 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 PRE-BID CONFERENCE

A. An virtual, non-mandatory pre-bid conference will be held, and representatives of the The Jefferson Project and the Project Manager / Landscape Architect will be present to discuss the Project.

B. Bidders are not required to participate in the conference to be considered responsive.

C. Landscape Architect will transmit to prospective Bidders a record of such Addenda as the Landscape Architect considers necessary in response to questions arising at the meeting. Oral statements made during the meeting may not be relied upon and will not be binding or legally effective.

1.05 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 The Jefferson Project 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.

1.06 BID SECURITY

A. Bid Security must be made payable to the The Jefferson Project, 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 The Jefferson Project may annul the Notice of Award and the Bid Security of that Bidder will be forfeited.

C. Bid Security of any Bidder whom the The Jefferson Project believes to have a reasonable chance of receiving the award may be retained by the The Jefferson Project 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.

1.07 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.

1.08 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.

1.09 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. The Jefferson Project 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 The Jefferson Project 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 Bid Documents. 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:

1.10 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 The Jefferson Project and promptly thereafter demonstrates to the reasonable satisfaction of the The Jefferson Project 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 The Jefferson Project, that Bidder will be disqualified from further Bidding on the Work to be provided under the Contract Documents.

1.11 AWARD OF CONTRACT

A. The Jefferson Project 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 The Jefferson Project 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 The Jefferson Project's intent to accept alternates (if any are accepted) in the order in which they are listed in the Bid form but the The Jefferson Project may accept them in any order or combination.

E. Subject to the approval of the The Jefferson Project, 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 The Jefferson Project has been duly obtained and a formal Notice of Award duly served on the Successful Bidder by the The Jefferson Project.

G. If the Contract is to be awarded, the The Jefferson Project 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 The Jefferson Project until the Agreement has been duly executed by the Bidder and the duly authorized officials of the The Jefferson Project.

1.12 SIGNING OF AGREEMENT

A. Within fifteen (15) days after the The Jefferson Project 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 The Jefferson Project 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 The Jefferson Project 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
PROPOSAL

Owner: The Jefferson Project

Project: Sculpture Park and Garden

Project Location: 1113 N Jefferson St.

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 The Jefferson Project 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 February 20, 2026 and Project Manual dated February 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 The Jefferson Project.

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

Base Bid:

Item	Description	Quantity	Unit	Unit Price	Amount
1	Mobilization (5% Max)	1	LS	$ _____	$ _____
2	Project Signage	1	LS	$ _____	$ _____
3	Construction Staking	1	LS	$ _____	$ _____
4	Rough Grading	15000	SFT	$ _____	$ _____

5	Finish Grading	60000	SFT	$ _____	$ _____
6	Additional Fill	450	CYD	$ _____	$ _____
7	SESC	1	LS	$ _____	$ _____
8	Clearing and Grubbing	1	LS	$ _____	$ _____
9	Allowance, Permit Fee	1	Allow.	$ 10,000	$ 10,000
10	Concrete Pavement Removal	110	SFT	$ _____	$ _____
11	Tree Protection Fencing	1	LS	$ _____	$ _____
12	Relocation of Overhead Electrical Utility to Underground	255	LF	$ _____	$ _____
13	Utility Pole Remove	1	EA	$ _____	$ _____
14	Parking Lot, Sealing and Striping	1	LS	$ _____	$ _____
15	Parking Lot, Barrier Free Sign	1	EA	$ _____	$ _____
16	Sidewalk Main, 4" Concrete	3250	SFT	$ _____	$ _____
17	Sidewalk Market, 4" Concrete	1375	SFT	$ _____	$ _____
18	Plaza, The Labyrinth Company Round Classical Paver Kit	1	EA	$ _____	$ _____
19	Decorative Gravel Walk, Crushed Limestone	3410	SFT	$ _____	$ _____
20	Corten Wall, 24" Height	362	LF	$ _____	$ _____
21	Corten Edging, 6" Height	776	LF	$ _____	$ _____
22	Removable Bollard	4	EA	$ _____	$ _____
23	Site Electrical Service	1	LS	$ _____	$ _____
24	Lightmart Windsor Pole Kit w/ Lantern	6	EA	$ _____	$ _____
25	Moon Gate Arbor	5	EA	$ _____	$ _____
26	Remove and Relocate Bench along Woodside Ave	1	LS	$ _____	$ _____
27	Install 6' Bench (provided by Owner)	11	EA	$ _____	$ _____
28	Trash Receptacles	5	EA	$ _____	$ _____
29	Trench Drain	12	LF	$ _____	$ _____
30	6" Perforated Underdrain	60	LF	$ _____	$ _____
31	Control Structure	1	EA	$ _____	$ _____
32	Connection to CB-7000	1	EA	$ _____	$ _____
33	12" HDPE Storm Sewer	27	LF	$ _____	$ _____
34	12" PVC Storm Sewer	72	LF	$ _____	$ _____
35	Stormwater Outlet End	1	EA	$ _____	$ _____
36	Electric, Plumbing, and Low Voltage Sleeves	420	LF	$ _____	$ _____
37	Deciduous Tree, Acer saccharum, 2" Cal.	4	EA	$ _____	$ _____

38	Deciduous Tree, Amelanchier canadensis, 1.5" Cal.	3	EA	$ _____	$ _____
39	Deciduous Tree, Betula nigra, 2" Cal.	5	EA	$ _____	$ _____
40	Deciduous Tree, Liriodendron tulipifera, 2" Cal.	2	EA	$ _____	$ _____
41	Deciduous Tree, Prunus pendula, 2" Cal.	2	EA	$ _____	$ _____
42	Evergreen Tree, Thuja occidentalis ‘Techny’, 7' Ht.	5	EA	$ _____	$ _____
43	Shrub, Cornus sericea, 5 Gal.	4	EA	$ _____	$ _____
44	Shrub, Ilex verticillata ‘Red Sprite’, 5 Gal.	9	EA	$ _____	$ _____
45	Shrub, Juniperus horizontalis ‘Blue Chip’, 3 Gal.	21	EA	$ _____	$ _____
46	Shrub, Lonicera sempervirens, 3 Gal.	20	EA	$ _____	$ _____
47	Shrub, Syringa x 'SMSJBP7', 5 Gal.	5	EA	$ _____	$ _____
48	Shrub, Taxus x Media 'Hicksii', 5 gal.	37	EA	$ _____	$ _____
49	Herbaceous perennial, Achillea millefolium, Plug	201	EA	$ _____	$ _____
50	Herbaceous perennial, Allium cernuum, Plug	25	EA	$ _____	$ _____
51	Herbaceous perennial, Amsonia hubrichtii, 1 Gal.	70	EA	$ _____	$ _____
52	Herbaceous perennial, Aster novae-angliae 'Purple Dome', 1 Gal.	6	EA	$ _____	$ _____
53	Herbaceous perennial, Baptisia australis, 3 Gal.	15	EA	$ _____	$ _____
54	Herbaceous perennial, Eragrostis spectabilis, Plug	166	EA	$ _____	$ _____
55	Herbaceous perennial, Geum triflorum, Plug	97	EA	$ _____	$ _____
56	Herbaceous perennial, Panicum virgatum 'Cloud Nine', 3 Gal.	24	EA	$ _____	$ _____
57	Herbaceous perennial, Penstemon digitalis, Plug	88	EA	$ _____	$ _____
58	Herbaceous perennial, Phlox subulata, 1 Gal.	86	EA	$ _____	$ _____
59	Herbaceous perennial, Rudbeckia fulgida, Plug	124	EA	$ _____	$ _____
60	Herbaceous perennial, Schizachyrium scoparium, 1 Gal.	60	EA	$ _____	$ _____

61	Herbaceous perennial, Sisyrinchium angustifolium, 1 Gal.	54	EA	$ _____	$ _____
62	Herbaceous perennial, Sporobolus heterolepis, Plug	85	EA	$ _____	$ _____
63	Annual Bulb, Dahlia x, 1 Gal.	18	EA	$ _____	$ _____
64	Corten Planters, 30" Diameter	3	EA	$ _____	$ _____
65	Irrigation	1	LS	$ _____	$ _____
66	Lawn Restoration, Poa pratensis	13,260	SFT	$ _____	$ _____
67	Bioretention Area, Complete	1	LS	$ _____	$ _____
68	Concrete Stage	205	SFT	$ _____	$ _____
69	Stage Retaining Wall	65	LF	$ _____	$ _____
70	Concrete Stairs	57	SF	$ _____	$ _____
71	Stair Railing	6	LF	$ _____	$ _____
72	Concrete Retaining Wall	47	LF	$ _____	$ _____
73	Concrete Seat Wall	85	LF	$ _____	$ _____
74	Recycled Brick Paver Inlay	200	SFT	$ _____	$ _____

Total Contract Price for Base Bid (Items 1 through 74) $_____

Alternate 1:

Item	Description	Quantity	Unit	Unit Price	Amount
A1	Site Sound System and Wiring	1	LS	$ _____	$ _____

Total Contract Price for Alternate 1 (Item A1) $_____

Alternate 2:

Item	Description	Quantity	Unit	Unit Price	Amount
A2	Projector Pole and Enclosure and Wiring	1	EA	$ _____	$ _____

Total Contract Price for Alternate 2 (Item A2) $_____

Alternate 3:

Item	Description	Quantity	Unit	Unit Price	Amount
A3	Projector and Enclosure, Mounted to Building	1	EA	$ _____	$ _____

Total Contract Price for Alternate 3 (Item A3) $_____

Alternate 4:

Item	Description	Quantity	Unit	Unit Price	Amount
A4	Rear Wall 10' to 4'	80	LF	$ _____	$ _____

Total Contract Price for Alternate 4 (Item A4) $_____

Alternate 5:

Item	Description	Quantity	Unit	Unit Price	Amount
A5	Decorative Wall, Board on Board Fence with Stone Veneer	900	SFT	$ _____	$ _____

Total Contract Price for Alternate 5 (Item A5) $_____

Alternate 6:

Item	Description	Quantity	Unit	Unit Price	Amount
A6	Lighting, Luminii Kurba Large w/ Mounting Hardware	460	LF	$ _____	$ _____

Total Contract Price for Alternate 6 (Item A6) $_____

Alternate 7:

Item	Description	Quantity	Unit	Unit Price	Amount
A7	Lighting, Luminii Kurba Large, Power Supply	23	EA	$ _____	$ _____

Total Contract Price for Alternate 7 (Item A7) $_____

Alternate 8:

Item	Description	Quantity	Unit	Unit Price	Amount
A8	Lighting, WAC Adjustable Spotlight w/ Power Stake	75	EA	$ _____	$ _____

Total Contract Price for Alternate 8 (Item A8) $_____

Alternate 9:

Item	Description	Quantity	Unit	Unit Price	Amount
A9	Lighting, Ligman Bollards	10	EA	$ _____	$ _____

Total Contract Price for Alternate 9 (Item A9) $_____

Alternate 10:

Item	Description	Quantity	Unit	Unit Price	Amount
A10	Lighting, Ecosense Trov-4' w/ Stakes, Louvers, and 1 Dimmer	20	EA	$ _____	$ _____

Total Contract Price for Alternate 10 (Item A10) $_____

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 The Jefferson Project 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 The Jefferson Project.

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 The Jefferson Project 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 The Jefferson Project 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 The Jefferson Project'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 The Jefferson Project 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 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 The Jefferson Project, 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 Sculpture Park and Garden.

NOW, THEREFORE, if the The Jefferson Project accepts the Bid of the Principal and the Principal will enter into a Contract with the The Jefferson Project 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 The Jefferson Project the difference not-to-exceed the penalty hereof between the amount specified in said Bid and such larger amount for which the The Jefferson Project 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 The Jefferson Project, 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: Sculpture Park and Garden

Pursuant to the provisions of Article 1.11 of the Instructions to Bidders (Section 00 21 13), you are hereby notified that the _____ (The Jefferson Project) 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: Art-themed public space featuring sweeping concrete sidewalks and an amphitheater space with landscape planters and a variety of sculpture areas and related furnishings and equipment. as delineated in your Bid submitted to The Jefferson Project on 03-06-2026.

Please comply with the following conditions within 5 days of the date of this Notice of Award; that is by _____, 20_____.

Deliver to Engineer _____ (_____) 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 The Jefferson Project 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 The Jefferson Project to consider your bid abandoned, to annul this Notice of Award and to declare your Bid Security forfeited.

Within 2 days after you comply with those conditions, The Jefferson Project 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 Engineer the required schedules prior to the scheduling of a Pre-Construction Meeting.

The Jefferson Project:

_____

Authorized Signature: _____

Copy to Wade Trim

SECTION 00 52 00
AGREEMENT

This Agreement, made and entered into this _____ day of _____ in the year 20___, by and between The Jefferson Project hereinafter called The Jefferson Project, and _____ hereinafter called Contractor, in consideration of the mutual covenants hereinafter sent forth, agree as follows:

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

Art-themed public space featuring sweeping concrete sidewalks and an amphitheater space with landscape planters and a variety of sculpture areas and related furnishings and equipment.

The Work will be substantially completed within **220 calendar days** after the date when the Contract Time commences to run as provided in paragraph 2.03 of Section 00 72 00, and completed and ready for final payment in accordance with paragraph 14.11 of Section 00 72 00 within **240 calendar days** after the date when the Contract Time commences to run.

Engineering and inspection costs incurred after the specified final completion date will be paid by the Contractor to the The Jefferson Project prior to final payment authorization.

Charges will be made at such times and in such amounts as the Engineer will invoice the The Jefferson Project, provided however said charges will be in accordance with the Engineer's current rate schedule at the time the costs are incurred.

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

The Jefferson Project and Contractor recognize that time is of the essence of this Agreement and that the The Jefferson Project 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 The Jefferson Project if the Work is not Substantially Complete on time. Accordingly, instead of requiring any such proof, the The Jefferson Project and the Contractor agree that as liquidated damages for delay (but not as penalty) the Contractor will pay the The Jefferson Project Seven Hundred and Fifty Dollars ($750.00) for each day that expires after the time specified in paragraph 1.03.A above for Substantial Completion until the Work is Substantially Complete.

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

The Jefferson Project will pay Contractor as provided in the attached Proposal for performance of the Work in accordance with the Contract Documents.

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:

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

_____ _____

Person representing the The Jefferson Project to whom requests for progress payments are to be submitted will be:

_____

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.

In order to induce the The Jefferson Project to enter into this Agreement, the Contractor makes the following representations:

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.

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).

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.

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

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

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

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).

This Agreement

Performance and other Bonds

Notice of Award

Notice to Proceed (if issued)

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

Specifications contained within Division 01 through 49 of the Project Manual

Plans bearing the following general title: Sculpture Park and Garden

Addenda numbers _____ to _____, inclusive

Documentation submitted by the Contractor prior to Notice of Award

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

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.

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.

The Jefferson Project 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.

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 The Jefferson Project 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 three counterparts. One counterpart each has been delivered to The Jefferson Project and Contractor, and one counterpart has been delivered to the Engineer. The Contract Documents have been signed or identified by The Jefferson Project and Contractor.

This Agreement will be effective on _____, 20____.

Owner: The Jefferson Project

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: Sculpture Park and Garden

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 Engineer 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 Engineer prior to delivery of any materials or start of any construction.

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

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

The Jefferson Project:

_____

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 The Jefferson Project, Contractor and/or Engineer 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 The Jefferson Project 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 The Jefferson Project for replacement of the Work, without cost to The Jefferson Project, 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 The Jefferson Project. If Contractor fails to make such repair within one (1) week from the date of receipt of such notice, then The Jefferson Project 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, The Jefferson Project may, but will not be required to, take immediate steps to repair such defects without notice to Contractor. In such event, The Jefferson Project 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 The Jefferson Project 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 The Jefferson Project for any cost incurred by The Jefferson Project in making such repairs.

If Contractor or Surety fail to do as hereinbefore specified, they will jointly and severally indemnity, defend, and hold harmless The Jefferson Project from and against all and any losses, costs, suits, and actions for damages of every kind and description brought or claimed against The Jefferson Project 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: _____ _

The Jefferson Project: _____ 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 Engineer to the best of Engineer's knowledge, information, and belief and subject to the limitations stated in the Contract Documents certifies to the The Jefferson Project 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: _____

The Jefferson Project: _____ 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 The Jefferson Project, 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 The Jefferson Project or its agents, and the Engineer or its agents, in addition to the regular items set forth in the Contract as dated above executed between myself and the The Jefferson Project and in the Change Orders for Work issued by the The Jefferson Project 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 The Jefferson Project? ___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: _____

The Jefferson Project:

_____ -

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
Engineer's Decision on Change Proposal	
____	

Contractor:	Engineer:	The Jefferson Project:
By: _____	By: _____	By: _____ ___
Date: _____	Date: _____	Date: _____

SECTION 00 65 16
CERTIFICATE OF SUBSTANTIAL COMPLETION

Project: Sculpture Park and Garden

The Jefferson Project: The Jefferson Project

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 Engineer when construction is sufficiently complete, in accordance with the Contract Documents, so the The Jefferson Project 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 Engineer 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 The Jefferson Project and the Contractor for security, maintenance, heat, utilities, damage to the Work and insurance will be as follows:

_____

The Jefferson Project will have **45** calendar days after receipt of this certificate during which The Jefferson Project may make written objection to Engineer 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.

Engineer: _____

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 The Jefferson Project 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 The Jefferson Project 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 The Jefferson Project: The Jefferson Project 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 The Jefferson Project 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 The Jefferson Project or lessee may withhold payment to a Contractor or Subcontractor who has not provided a Sworn Statement. The Jefferson Project 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.

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

If the contract provides for payments by the The Jefferson Project to the Contractor, if any, in the normal course of construction, but the The Jefferson Project elects to pay lien claimants directly, the first time the The Jefferson Project 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 The Jefferson Project 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 The Jefferson Project 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 Engineer and signed by The Jefferson Project, 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 Engineer 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 The Jefferson Project 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 Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer’s decision regarding a Change

Proposal; seeking resolution of a contractual issue that Engineer 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 The Jefferson Project, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.

c. A demand or assertion by The Jefferson Project or Contractor, duly submitted in compliance with the procedural requirements set forth herein, arising after Engineer 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 The Jefferson Project 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 The Jefferson Project 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 Engineer's written recommendation of final payment in accordance with paragraph 14.11.

15. Contractor -- The person, firm or corporation with whom The Jefferson Project 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 Engineer'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. Engineer -- The person, firm, or corporation identified in the Supplementary Instructions to Bidders hired by The Jefferson Project to prepare Plans and Specifications for the Project and to assist The Jefferson Project in interpreting Plans and Specifications during the performance of the Work. Engineer’s authority and responsibility are set forth in the Contract between The Jefferson Project and Engineer. Contractor acknowledges and agrees that Engineer’s obligations and duties under Engineer’s contract with The Jefferson Project are obligations and duties to The Jefferson Project only, and Engineer 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 Engineer 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 The Jefferson Project 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 The Jefferson Project to the apparent successful Bidder stating that, upon compliance by the apparent successful Bidder with the conditions precedent enumerated therein, within the time specified, The Jefferson Project will sign and deliver the Agreement.

30. Notice to Proceed -- A written notice given by The Jefferson Project to Contractor (with a copy to Engineer) 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. The Jefferson Project -- 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 The Jefferson Project 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 Engineer or The Jefferson Project; 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 Engineer 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 Engineer'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 The Jefferson Project upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by The Jefferson Project 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 Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; The Jefferson Project-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 Engineer 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 Engineer'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 The Jefferson Project, to furnish materials or equipment to be incorporated in the Work by Contractor or any Subcontractor.

52. Unit Price -- Construction Work where The Jefferson Project 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 The Jefferson Project and reviewed by Engineer, 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 Engineer 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 Engineer 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 The Jefferson Project, Contractor will also deliver to The Jefferson Project 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 The Jefferson Project.

2.02 COPIES OF DOCUMENTS

A. The Jefferson Project 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 Engineer 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 Engineer. A minimum of 3 full working days' notice will be required.

B. Prior to the scheduling of the Preconstruction Meeting, Contractor will submit to Engineer 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, The Jefferson Project, Engineer, 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 The Jefferson Project, Engineer, 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. Engineer 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 The Jefferson Project 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 The Jefferson Project or Engineer 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 The Jefferson Project or Engineer 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 Engineer 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 The Jefferson Project, Contractor or Engineer, 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 The Jefferson Project, Engineer or any of Engineer’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 Engineer any conflict, error, ambiguity, or discrepancy which Contractor should reasonably have discovered and will obtain a written interpretation or clarification from Engineer 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 Engineer 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 Engineer or The Jefferson Project. However, Contractor will not be liable to The Jefferson Project or Engineer 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 The Jefferson Project will submit to Engineer 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. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.

B. Engineer 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. Engineer’s written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on The Jefferson Project, 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 Engineer will promptly notify The Jefferson Project and Contractor in writing that Engineer is unable to provide a decision or interpretation. If The Jefferson Project 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. Engineer's review of a Shop Drawing or Sample (pursuant to paragraph 6.21), or

3. Engineer'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 The Jefferson Project:

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 Engineer or Engineer'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 The Jefferson Project and Engineer and specific written verification or adaptation by Engineer.

3.08 ELECTRONIC DATA

A. Except as otherwise stated elsewhere in the Contract Documents, The Jefferson Project, Engineer 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. The Jefferson Project 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. The Jefferson Project 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 The Jefferson Project, 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 The Jefferson Project nor Engineer 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 The Jefferson Project, Engineer or any of Engineer'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 The Jefferson Project and Engineer 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. Engineer's Review. After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of The Jefferson Project'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 The Jefferson Project 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 The Jefferson Project in writing of Engineer's findings, conclusions, and recommendations.

C. The Jefferson Project's Statement to Contractor Regarding Site Condition. After receipt of Engineer's written findings, conclusions, and recommendations, The Jefferson Project will issue a written statement to Contractor (with a copy to Engineer) 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 Engineer'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 The Jefferson Project 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 The Jefferson Project 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 The Jefferson Project's issuance of The Jefferson Project'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 The Jefferson Project or Engineer by the owners of such Utilities, including The Jefferson Project, or by others.

1. The Jefferson Project and Engineer 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 The Jefferson Project) 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 The Jefferson Project and Engineer.

C. Engineer's Review. Engineer 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 The Jefferson Project 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 The Jefferson Project in writing of Engineer's findings, conclusions, and recommendations.

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

E. The Jefferson Project's Statement to Contractor Regarding Utilities. After receipt of Engineer's written findings, conclusions, and recommendations, The Jefferson Project will issue a written statement to Contractor (with a copy to Engineer) 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 Engineer'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 The Jefferson Project 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 The Jefferson Project’s issuance of The Jefferson Project’s written statement to Contractor regarding the Underground Facility in question.

4.05 REFERENCE POINTS

A. The Jefferson Project 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 The Jefferson Project. Contractor will report to Engineer 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 The Jefferson Project at the expense of Contractor. Construction Staking will be furnished by The Jefferson Project as provided in Division 01 of the Specifications.

4.06 CONSTITUENTS OF CONCERN

A. The Jefferson Project 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. The Jefferson Project 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 The Jefferson Project and Engineer (and thereafter confirm such notice in writing). The Jefferson Project will promptly consult with Engineer concerning the necessity for The Jefferson Project 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 The Jefferson Project 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 The Jefferson Project 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 The Jefferson Project 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 The Jefferson Project 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. The Jefferson Project may have such deleted portion of the Work performed by The Jefferson Project's own forces or others in accordance with paragraph 7.01.

F. To the fullest extent permitted by Laws and Regulations, The Jefferson Project will indemnify and hold harmless Contractor, Subcontractors, Engineer, Engineer'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 The Jefferson Project 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 The Jefferson Project.

5.02 LICENSED INSURERS AND SURETIES

A. Bonds and insurance required by the Contract Documents to be purchased and maintained by The Jefferson Project 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, The Jefferson Project(s) and Engineer(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 The Jefferson Project and Engineer 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 The Jefferson Project an Owner's Protective Liability policy to protect The Jefferson Project, Engineer, 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 The Jefferson Project 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. The Jefferson Project, and Engineer(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 The Jefferson Project, 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 The Jefferson Project and Contractor and paid to The Jefferson Project 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. The Jefferson Project's responsibilities in respect of purchasing and maintaining insurance are set forth below:

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

a. The Jefferson Project will assume responsibility for such insurance as will protect The Jefferson Project against any loss of use of The Jefferson Project'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 The Jefferson Project and to Engineer 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 The Jefferson Project and Engineer, 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 The Jefferson Project and Engineer.

B. Prior to the commencement of the Work, Contractor will furnish to The Jefferson Project 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. The Jefferson Project 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 The Jefferson Project.

5.08 DAMAGE CLAIMS - ACKNOWLEDGMENT AND REPORTS

A. Contractor will furnish to The Jefferson Project 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 The Jefferson Project 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. The Jefferson Project and Contractor intend that all policies purchased in accordance with paragraph 5.03 will protect The Jefferson Project, Contractor, Subcontractors, Engineer, Engineer’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. The Jefferson Project 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, Engineer, Engineer’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 The Jefferson Project 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 The Jefferson Project and made payable to The Jefferson Project 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. The Jefferson Project 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 The Jefferson Project's exercise of this power. If such objection be made, The Jefferson Project 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, The Jefferson Project 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 The Jefferson Project and Engineer 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 The Jefferson Project's written consent given after prior written notice to Engineer.

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 The Jefferson Project. If required by Engineer, 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 Engineer. 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 Engineer, 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 Engineer under the following circumstances:

1. “Or-Equal”: If in Engineer’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 Engineer as an “or-equal” item, in which case review and approval of the proposed item may, in Engineer’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 Engineer’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 Engineer 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 Engineer will include the following, as supplemented in the Specifications, and as Engineer may decide is appropriate under the circumstances. Requests for review of substitute items of material and equipment will not be accepted by Engineer from anyone other than Contractor.

C. If Contractor wishes to furnish or use a substitute, Contractor will make written application to Engineer 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 The Jefferson Project 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 Engineer in evaluating the proposed substitute. Engineer 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. Engineer will be the sole judge of acceptability, and Engineer’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 Engineer's prior written acceptance. The Jefferson Project 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 Engineer.

F. Engineer will record time required by Engineer and Engineer's consultants in evaluating substitutions proposed by Contractor and in making changes in the Contract Documents occasioned thereby. Whether or not Engineer accepts a proposed substitute, Contractor will reimburse The Jefferson Project for the charges of Engineer and Engineer'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 The Jefferson Project or Engineer may have

reasonable objection. Contractor will furnish Engineer 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 The Jefferson Project or Engineer will not constitute a waiver of any right of The Jefferson Project or Engineer to reject defective Work.

B. If The Jefferson Project or Engineer, 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 The Jefferson Project.

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 The Jefferson Project or Engineer and any such Subcontractor, Supplier or other person or organization, nor will it create any obligation on the part of The Jefferson Project or Engineer to pay or to see to the payment of any moneys due any Subcontractor, Supplier or other person or organization. The Jefferson Project or Engineer 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 Engineer through Contractor.

F. If the amount of the subcontract or the nature of the Work to be performed thereunder warrants, The Jefferson Project may require Subcontractor to furnish, for the benefit of The Jefferson Project 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 The Jefferson Project and Engineer. 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 The Jefferson Project, Contractor, Engineer, Engineer’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 The Jefferson Project.

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 The Jefferson Project or Engineer 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 The Jefferson Project in Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Contractor will defend, indemnify and hold harmless The Jefferson Project and Engineer 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. The Jefferson Project 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 The Jefferson Project nor Engineer 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. The Jefferson Project 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 The Jefferson Project 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 The Jefferson Project 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 The Jefferson Project 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 Engineer. If within 24 hours after receipt of such notice Contractor will fail to clean such areas satisfactorily, The Jefferson Project may have such other agency as The Jefferson Projecthe 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 The Jefferson Project 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 Engineer for examination and will be delivered to Engineer for The Jefferson Project 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, The Jefferson Project 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 Engineer has issued a notice to The Jefferson Project and Contractor in accordance with paragraph 14.11 that the Work is Acceptable.

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

F. Contractor will inform The Jefferson Project and Engineer of the specific requirements of Contractor's safety program with which The Jefferson Project's and Engineer'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, Engineer has issued a written notice to The Jefferson Project 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 The Jefferson Project or Engineer, is obligated to act to prevent threatened damage, injury or loss. Contractor will give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If Engineer 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 Engineer for review, in accordance with an accepted schedule. All Submittals will be identified as Engineer 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 Engineer the materials and equipment Contractor proposes to provide and to enable Engineer 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 Engineer 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 Engineer may require to enable Engineer 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 Engineer'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 Engineer for review of each such variation.

G. Contractor will make corrections required by Engineer 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 Engineer 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. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of Shop Drawings, sample, or other item requiring approval, and Contractor will be responsible for Engineer's charges to The Jefferson Project for such time. The Jefferson Project 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 Engineer's charges to The Jefferson Project for its review time, and The Jefferson Project 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 ENGINEER'S REVIEW

A. Engineer will review Shop Drawings and Samples in accordance with the Schedule of Submittals accepted by Engineer as required by paragraph 2.05. Engineer'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. Engineer'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 Engineer's attention to such variation at the time of submission and Engineer has given written concurrence to the specific variation, nor will any concurrence by Engineer relieve Contractor from responsibility for errors or omissions in the Shop Drawings. Engineer’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 Engineer per paragraph 2.05, no related Work will be commenced until the Submittal has been reviewed by Engineer.

6.22 CONTINUING THE WORK

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

6.23 CONTRACTOR’S GENERAL WARRANTY AND GUARANTEE

A. Contractor warrants and guarantees to The Jefferson Project, Engineer, and Engineer’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 Engineer;

2. recommendation of any progress or final payment by Engineer;

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

4. use or occupancy of any part of the Work by The Jefferson Project;

5. any acceptance by The Jefferson Project 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 Engineer per paragraph 14.11;

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

8. any correction of defective Work by The Jefferson Project.

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

D. Contractor will assign to The Jefferson Project 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 The Jefferson Project.

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 The Jefferson Project) and hold harmless The Jefferson Project, Engineer 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 The Jefferson Project or Engineer, 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. The Jefferson Project, 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 The Jefferson Project, Engineer 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, The Jefferson Project and

Engineer 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 Engineer.

C. The Jefferson Project and Engineer 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, Engineer'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. Engineer'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 The Jefferson Project or Engineer.

ARTICLE 7 WORK BY OTHERS

7.01 RELATED WORK AT SITE

A. In addition to and apart from the Work under the Contract Documents, The Jefferson Project may perform other work at or adjacent to the Site. Such other work may be performed by The Jefferson Project's employees, or through contracts between The Jefferson Project and third parties. The Jefferson Project 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 Engineer 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 The Jefferson Project, if The Jefferson Project is performing the additional work with The Jefferson Project'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 Engineer and the others whose work will be affected.

D. If the performance of additional work by other contractors, utility owner, or The Jefferson Project 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 The Jefferson Project 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 THE JEFFERSON PROJECT'S RESPONSIBILITIES

8.01 COMMUNICATION TO CONTRACTOR

A. Except as otherwise provided in these General Conditions, The Jefferson Project will issue all communications to Contractor through Engineer.

8.02 REPLACEMENT OF ENGINEER

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

8.03 FURNISHING DATA

A. The Jefferson Project will furnish the data required of The Jefferson Project under the Contract Documents promptly.

8.04 PAY WHEN DUE

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

8.07 INSPECTIONS, TESTS, AND APPROVALS

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

ARTICLE 9 ENGINEER'S STATUS DURING CONSTRUCTION

9.01 THE JEFFERSON PROJECT'S REPRESENTATIVE

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

9.02 VISITS TO SITE

A. Engineer 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 The Jefferson Project, in general, if the Work is proceeding in accordance with the technical requirements of the Contract Documents. It will not be the responsibility of Engineer to make exhaustive or continuous on Site inspections to check the quality or quantity of the Work.

9.03 RESIDENT PROJECT REPRESENTATIVE

A. If The Jefferson Project and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more continuous observation of the Work. A Resident Project Representative will act as directed by and under the supervision of Engineer. Resident Project Representative's dealings in matters pertaining to the on Site Work will in general be only with Engineer 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 Engineer and The Jefferson Project, and notify those expected to attend in advance.

3. Liaison:

    a. Serve as Engineer'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 Engineer in serving as The Jefferson Project's liaison

with Contractor when Contractor's operations affect The Jefferson Project's on Site operations.

4. Shop Drawings and Samples:

    a. Advise Engineer 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 Engineer.

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

    a. Conduct on Site observations of the Work and report to Engineer 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 Engineer 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 Engineer 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 Engineer.

6. Modifications:

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

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 Engineer 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. Engineer will issue with reasonable promptness such written clarifications or interpretations of the Contract Documents as Engineer 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. Engineer 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 The Jefferson Project, and also on Contractor who will perform the change promptly. If The Jefferson Project 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. Engineer will have authority to disapprove or reject completed portions of the Work which Engineer 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. Engineer's responsibility for Shop Drawings and samples are set forth in paragraphs 6.19 through 6.21 inclusive.

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

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

9.08 DETERMINATIONS FOR UNIT PRICE WORK

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

9.09 DECISIONS ON DISAGREEMENTS, CLAIMS

A. Engineer 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 Engineer in writing with a request for a formal decision in accordance with this paragraph 9.09.

B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If The Jefferson Project 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. Engineer's written decision on the issue referred will be final and binding on The Jefferson Project and Contractor, subject to the provisions of paragraph 11.01.

D. In this capacity Engineer will not show partiality to The Jefferson Project 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 ENGINEERS RESPONSIBILITIES

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

B. Engineer 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. Engineer 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 Engineer's Consultant's, Resident Project Representative and assistants.

C. Engineer 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. Engineer 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 Engineer in preparation for, arising from, relating to, or concerning the Project. Such acts or omissions include, but are not limited to, Engineer's negligence, tortuous conduct, errors, omissions, strict liability, breach of contract, or breach of warranty. Engineer makes no representations to Contractor, Subcontractors, Suppliers or their agents or employees regarding or respecting any work performed by Engineer 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 Engineer's agreement with The Jefferson Project, nor are such parties intended beneficiaries of Engineer's duties or responsibilities arising therefrom. Engineer disclaims all duties to Contractor, Subcontractors, Suppliers or their agents or employees arising from, relating to, or concerning Engineer's involvement in the Project. The Jefferson Project and Contractor further agree to notify all Contractor's,

Subcontractors or Suppliers of this disclaimer of Engineer'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. The Jefferson Project 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 Engineer. 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. The Jefferson Project 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. Engineer 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 The Jefferson Project 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 THE JEFFERSON PROJECT-AUTHORIZED CHANGES IN THE WORK

A. Without invalidating the Contract and without notice to any surety, The Jefferson Project may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes will be supported by Engineer'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 The Jefferson Project 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 The Jefferson Project 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 The Jefferson Project 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 Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer 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 Engineer 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 Engineer and The Jefferson Project 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. Engineer will advise The Jefferson Project regarding the Change Proposal and consider any comments or response from Owner regarding the Change Proposal.

2. Engineer's Action: Engineer 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 The Jefferson Project and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either The Jefferson Project or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under paragraph 11.01.

3. Binding Decision: Engineer's decision will be final and binding upon The Jefferson Project and Contractor, unless The Jefferson Project 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 Engineer will notify the parties that Engineer 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. The Jefferson Project 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 The Jefferson Project set-off, unless Contractor has duly contested such set-off;

3. changes in the Work which are:

a. ordered by The Jefferson Project pursuant to paragraph 10.02,

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

c. agreed to by the parties, subject to the need for Engineer'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 The Jefferson Project 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 The Jefferson Project and Contractor will be submitted to the Claims process set forth in this Article:

1. Appeals by The Jefferson Project or Contractor of Engineer's decisions regarding Change Proposals;

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

3. Disputes that Engineer 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 Engineer, 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 Engineer.

D. Mediation:

1. At any time after initiation of a Claim, The Jefferson Project 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 The Jefferson Project and Contractor agree to mediation, then after 60 days from such agreement, either The Jefferson Project 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. The Jefferson Project 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 The Jefferson Project 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 The Jefferson Project, 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 The Jefferson Project 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 The Jefferson Project.

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 The Jefferson Project deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to The Jefferson Project. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to The Jefferson Project, 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 The Jefferson Project, Contractor will obtain competitive bids from Subcontractors acceptable to The Jefferson Project and Contractor and will deliver such bids to The Jefferson Project, who will then determine, with the advice of Engineer, 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 The Jefferson Project with the advice of Engineer, 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 The Jefferson Project. 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 Engineer 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 The Jefferson Project and Engineer.

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 The Jefferson Project to cover unanticipated costs.

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

E. Within 30 days of Engineer's written decision under the preceding paragraph 12.03.D, Contractor may submit a Change Proposal, or The Jefferson Project 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 The Jefferson Project, Engineer, or anyone for whom The Jefferson Project 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 The Jefferson Project, 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 The Jefferson Project, 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 The Jefferson Project or Engineer 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 The Jefferson Project 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 The Jefferson Project or Engineer 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 The Jefferson Project 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 The Jefferson Project or Engineer 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 The Jefferson Project or anyone for whom The Jefferson Project 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. The Jefferson Project, Engineer and Engineer's representatives, other representatives of The Jefferson Project, 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 The Jefferson Project and Engineer of Contractor's Site safety procedures and programs so that The Jefferson Project and Engineer may comply therewith as applicable.

13.02 TESTS AND INSPECTIONS

A. Contractor will give Engineer 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 Engineer 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 The Jefferson Project's or Engineer'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 The Jefferson Project 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 The Jefferson Project and Contractor or by Engineer 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 Engineer 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 Engineer, or contrary to the written request of Engineer, it will, if requested by Engineer, be uncovered by Contractor for Engineer's observation. Such uncovering will be at Contractor's expense unless Contractor has given Engineer timely written notice of Contractor's intention to cover such Work and Engineer has not acted with reasonable promptness in response to such notice.

B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, will uncover, expose or otherwise make available for observation, inspection or testing as Engineer 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, The Jefferson Project 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. Engineer’s Authority: Engineer 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, The Jefferson Project may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of The Jefferson Project to stop the Work will not give rise to any duty on the part of The Jefferson Project 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 Engineer or The Jefferson Project, Contractor will promptly either correct all defective Work, whether or not fabricated, installed or completed, or if the Work has been rejected by Engineer, 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 The Jefferson Project'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 The Jefferson Project and in accordance with The Jefferson Project's written instructions:

1. repair defective land or areas;

2. correct such defective Work;

3. if the defective Work has been rejected by The Jefferson Project, 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, The Jefferson Project 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, The Jefferson Project (and, prior to Engineer's recommendation of final payment, also Engineer) prefers to accept it, The Jefferson Project may do so. Contractor will pay all claims, costs, losses, damages and expenses attributable to The Jefferson Project's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness). In such case, if acceptance occurs prior to Engineer'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 The Jefferson Project 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 The Jefferson Project.

13.09 OWNER MAY CORRECT DEFECTIVE WORK

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer 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), The Jefferson Project may, after 48 hours' written notice to Contractor and Contractor's Surety without prejudice to any other remedy The Jefferson Project may have, correct and remedy any such deficiency.

B. In exercising The Jefferson Project's rights and remedies under this paragraph 13.09, The Jefferson Project will proceed expeditiously. To the extent necessary to complete corrective and remedial action, The Jefferson Project 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 The Jefferson Project has paid Contractor but which are stored elsewhere. Contractor will allow The Jefferson Project, The Jefferson Project's representatives, agents and employees, The Jefferson Project’s other contractors, and Engineer’s consultants such access to the Site as may be necessary to enable The Jefferson Project to exercise The Jefferson Project's rights and remedies under this paragraph 13.09.

C. All claims, costs, losses, damages and expenses incurred or sustained by The Jefferson Project 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. The Jefferson Project 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 The Jefferson Project of The Jefferson Project'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 Engineer 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 Engineer 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 Engineer, 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 Engineer 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 Engineer or The Jefferson Project may reasonably require. The Payment Schedule will be on the form provided in the Contract Documents or in a format acceptable to Engineer or The Jefferson Project. 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 The Jefferson Project, as will establish The Jefferson Project's title to the material and equipment and protect The Jefferson Project'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 The Jefferson Project 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 The Jefferson Project deems necessary.

14.04 REVIEW OF APPLICATIONS FOR PROGRESS PAYMENT

A. Engineer 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 The Jefferson Project, or may return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

B. Engineer's recommendation of any payment requested in Contractor's Application for Payment will constitute a representation by Engineer to The Jefferson Project, based on Engineer'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 Engineer'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 Engineer's responsibility to observe the Work.

C. However, by recommending any such payment Engineer 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 Engineer 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 The Jefferson Project or entitle The Jefferson Project to withhold payment to Contractor.

D. Neither Engineer's review of Contractor's Work for the purpose of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

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 The Jefferson Project free and clear of Liens.

E. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make such representations as stated above to The Jefferson Project. Engineer 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 Engineer's opinion to protect The Jefferson Project 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. The Jefferson Project has been required to correct defective Work in accordance with paragraph 1309, or has accepted defective Work in accordance with paragraph 13.08;

4. The Jefferson Project has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

5. Engineer 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 The Jefferson Project with Engineer's recommendation, the amount recommended will (subject to the provisions of paragraph 14.05.B) become due, (or only if The Jefferson Project is a public agency, within 15 days after The Jefferson Project 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 The Jefferson Project to Contractor.

B. The Jefferson Project may refuse to make payment of the full amount recommended by Engineer because:

1. Claims have been made against The Jefferson Project based on Contractor's conduct in the performance or furnishing of the Work, or The Jefferson Project 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. The Jefferson Project has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

6. The Jefferson Project 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. The Jefferson Project 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 The Jefferson Project to secure the satisfaction and discharge of such Liens;

13. there are other items as set forth in the Contract Documents entitling The Jefferson Project to a set off against the amount recommended; or

14. The Jefferson Project 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 The Jefferson Project refuses to make payment of the full amount recommended by Engineer, The Jefferson Project will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. The Jefferson Project will promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by The Jefferson Project and Contractor, when Contractor corrects, to The Jefferson Project'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 The Jefferson Project'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 The Jefferson Project 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 The Jefferson Project and Engineer in writing that the entire Work is substantially complete and

request that Engineer issue a Certificate of Substantial Completion. Contractor will at the same time submit to The Jefferson Project and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor's notification, The Jefferson Project, Contractor, and Engineer will make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. Once Engineer considers the Work substantially complete, Engineer will deliver to The Jefferson Project a preliminary Certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer will attach to the certificate a punch list of items to be completed or corrected before final payment. The Jefferson Project will have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to The Jefferson Project, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefore. If The Jefferson Project does not object to the provisions of the certificate, or if despite consideration of The Jefferson Project's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to The Jefferson Project 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 Engineer believes justified after consideration of any objections from The Jefferson Project.

D. At the time of receipt of the preliminary Certificate of Substantial Completion, The Jefferson Project and Contractor will confer regarding The Jefferson Project'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 The Jefferson Project. Unless The Jefferson Project and Contractor agree otherwise in writing, The Jefferson Project will bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon The Jefferson Project'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. The Jefferson Project 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 The Jefferson Project of completed portions of the Work may be accomplished prior to Substantial Completion of all the Work subject to the following:

1. The Jefferson Project at any time may request Contractor in writing to permit The Jefferson Project to use any part of the Work which The Jefferson Project 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 The Jefferson Project and Engineer that said part of the Work is substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time thereafter The Jefferson Project, Contractor and Engineer will make an inspection of that part of the Work to determine its status of completion.

a. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify The Jefferson Project and Contractor in writing giving reasons therefor.

b. If Engineer considers that part of the Work to be substantially complete, Engineer will execute and deliver to The Jefferson Project 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, Engineer will deliver to The Jefferson Project and Contractor a written recommendation as to the division of responsibilities pending final payment between The Jefferson Project and Contractor with respect to security, operation, safety, maintenance, utilities and insurance for that part of the Work, which will become binding upon The Jefferson Project and Contractor at the time of issuing the definitive certificate of Substantial Completion for that part of the Work unless The Jefferson Project and Contractor will have otherwise agreed in writing and so informed Engineer.

3. The Jefferson Project will have the right to exclude Contractor from any part of the Work which Engineer has so certified to be substantially complete, but The Jefferson Project 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, The Jefferson Project 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, The Jefferson Project and Contractor have agreed as to the division of responsibilities between The Jefferson Project 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, Engineer will make a final inspection with The Jefferson Project 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 Engineer 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 Engineer 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 Engineer may reasonably require, consent of Surety, if any, to final payment, together with complete and legally effective releases or waivers, satisfactory to The Jefferson Project, 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 The Jefferson Project, 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 The Jefferson Project or The Jefferson Project'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 The Jefferson Project to indemnify The Jefferson Project against any Claim or Lien.

14.11 FINAL PAYMENT AND ACCEPTANCE

A. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation (all as required by the Contract Documents), Engineer is satisfied that to the best of Engineer’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, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer’s Certificate for Payment and present the application to The Jefferson Project for payment. At that time Engineer will give written notice to The Jefferson Project and Contractor that the Work is acceptable subject to the provisions of paragraph 14.13.

B. Otherwise, Engineer 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, The Jefferson Project 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 Engineer less any amounts of The Jefferson Project claimed set-offs allowed under the Contract Documents, including but not limited to any applicable liquidated damages as determined by The Jefferson Project. If The Jefferson Project rejects the Application, The Jefferson Project 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 Engineer so confirms, The Jefferson Project will, upon receipt of Contractor's final Application for Payment and recommendation of Engineer, 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 The Jefferson Project 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 Engineer 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 The Jefferson Project 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 The Jefferson Project 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 The Jefferson Project 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 The Jefferson Project, 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 THE JEFFERSON PROJECT MAY SUSPEND WORK

A. The Jefferson Project may, at any time and without cause, suspend the Work or any portion thereof for a period as The Jefferson Project may deem necessary by notice in writing to Contractor and Engineer. 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 THE JEFFERSON PROJECT 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 Engineer or The Jefferson Project; or,

9. Contractor otherwise violates any provisions of the Contract Documents.

B. The Jefferson Project 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 The Jefferson Project has paid Contractor but which are stored elsewhere, finish the Work as The Jefferson Project may deem expedient, and/or enforce the rights available to The Jefferson Project 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 The Jefferson Project 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 The Jefferson Project. Such claims, costs, losses, damages and expenses incurred by The Jefferson Project will be reviewed as to reasonableness by Engineer and when so approved, incorporated in a Change Order, but when exercising any rights or remedies under this paragraph, The Jefferson Project will not be required to obtain the lowest price for the Work performed.

D. Where Contractor's services have been so terminated by The Jefferson Project, the termination will not affect any rights or remedies of The Jefferson Project against Contractor or its Surety then existing or which may thereafter accrue. Any retention or payment of monies due Contractor by The Jefferson Project will not release Contractor from liability.

15.03 TERMINATION FOR CONVENIENCE

A. Upon 7 days' written notice to Contractor and Engineer, The Jefferson Project 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 The Jefferson Project of all purchase orders and subcontracts to the extent they relate to the performance of Work terminated or assign to The Jefferson Project those orders and subcontracts and revoke agreements specified in such notice;

4. Reasonably assist The Jefferson Project, as specifically requested in writing, in the maintenance, protection and disposition of property acquired by The Jefferson Project under the Contract Documents, as may be necessary;

5. Complete performance of any Work which is not terminated; and

6. Deliver to The Jefferson Project 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 The Jefferson Project 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 The Jefferson Project and Engineer, 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 The Jefferson Project, or under an order of court or other public authority, then Contractor may, upon 7 days written notice to The Jefferson Project and Engineer and provided The Jefferson Project or Engineer does not remedy such suspension or failure within that time, terminate the Agreement and recover from The Jefferson Project 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 The Jefferson Project.

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 The Jefferson Project 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, The Jefferson Project 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 The Jefferson Project, Engineer, 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 The Jefferson Project 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 The Jefferson Project or Engineer:

1. to any preference, priority or allocation order duly issued by The Jefferson Project;

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 The Jefferson Project, acts of another contractor in the performance of a Contract with The Jefferson Project, 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 Engineer will invoice The Jefferson Project, provided, however said charges will be in accordance with Engineer'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 The Jefferson Project 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 The Jefferson Project 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 Engineer 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 Engineer 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 Engineer 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 Engineer’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 Engineer 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 The Jefferson Project. Contractor will report to Engineer 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 The Jefferson Project 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:

   The Jefferson Project, 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 The Jefferson Project'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 The Jefferson Project, then the Contractor will pay to the The Jefferson Project 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 The Jefferson Project or Engineer.

c. To any preference, priority or allocation order duly issued by the The Jefferson Project.

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 The Jefferson Project, acts of another Contractor in the performance of a Contract with the The Jefferson Project, 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 an art-themed public space featuring sweeping concrete sidewalks and an amphitheater space with landscape planters and a variety of sculpture areas and related furnishings and equipment.

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 The Jefferson Project, which would affect this Contract.

1.04 RIGHT-OF-WAY JURISDICTION/PERMITS

A. All adjacent roads and streets in the immediate vicinity of the Project are under the jurisdiction of the City of Bay City.

B. Work in the Bay City right-of-way requires a permit from the City of Bay City. Contractor will obtain the permit and pay all fees in connection with obtaining the permit. The fees for the permit are based upon a permit fee, plan review fee, and an inspection deposit.

C. Soil erosion and sedimentation control is under the jurisdiction of the Bay County Drain Commissioner.

D. 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 Bay City Water Department will be notified. Valves will be opened or closed only by the Bay City 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 Bay City 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 The Jefferson Project.

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 The Jefferson Project.

B. Work performed under Allowances will be subject to The Jefferson Project 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 The Jefferson Project.

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 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 Engineer 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 Engineer, 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 Engineer from the designated Supplier.

D. Allowances will be used only as directed for The Jefferson Project'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 The Jefferson Project by Change Order.

1.07 SPECIFIC ALLOWANCES

A. Permit Fees:

1. Allowance for building and other permit fees will be paid for at the actual cost as invoiced by Contractor. Contractor will not be allowed any markups from the amount as invoiced. Costs for coordination, profit, overhead, insurance, and the time necessary to obtain the permit, will be incidental to the Project.

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. The Jefferson Project will make no allowances for items not included in Section 00 42 43 - Proposal.

1.02 ITEMS OF THE PROPOSAL

Item 1

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 The Jefferson Project'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

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 staking,

and other items necessary to complete the Work, whether specifically mentioned or implied.

Item 4-5

Site Grading 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 grade the site to the lines, grades and cross sections shown on the plans, and will include, but is not limited to, the removal and disposal of unsuitable material, the excavation and stockpiling of topsoil, grading, shaping, excavating, and compacting the site, the removal and disposal of excess or unsuitable material, , 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 6

Additional Fill 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 fill material 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.

Item 7

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 8

Clearing and Grubbing 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 clearing and grubbing and will include, but is not limited to, cutting, chipping, removing and disposing of trees, stumps, brush, hedges, roots, corduroy, logs, matted roots, other vegetation and debris, also the protection of plant life, existing structures and improvements not designated for removal, also the backfill, backfilling of holes, restoration, and for other items necessary to complete the job, whether specifically mentioned or implied.

Clearing and grubbing will be measured in acres, as specified. The area in acres of clearing and grubbing, within the limits shown on the Plans or authorized by Landscape Architect will be computed as the area bounded by the outside line of the trees removed. The length of the clearing and grubbing area will be measured along the road centerline or reference line established by Landscape Architect.

Clearing and grubbing will be measured in stations, as specified, and will be measured along the road centerline, within the limits shown on the Plans, or authorized by Landscape Architect, and based on clearing and grubbing on both sides of the road. Where clearing

and grubbing occurs on only one (1) side of the road, it will be measured on the basis of half the distance along the centerline.

Item 9

Allowance, Permit Fees to cover costs to complete and obtain outstanding permits that are required for the specified Work. Contractor will submit appropriate documentation to validate the actual cost of completing and obtaining the outstanding permit(s). The amount of the allowance will be adjusted accordingly by Change Order to recognize the allowable cost incurred by Contractor at direction of The Jefferson Project.

Item 10

Concrete Pavement, Removal 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 removal of concrete pavement in excess of six (6) inches thick, or for the removal of concrete base course with asphalt surfacing in excess of six (6) inches thick, as shown on the Plans or as determined by Landscape Architect. This work will include, but is not limited to saw cutting, removal and disposal of asphaltic surface courses and integral curbs, removal and disposal of unsuitable materials, furnishing, placing, and compacting backfill, protection of existing improvements, barricading, and for other items necessary to complete the job, whether specifically mentioned or implied.

Measurement for removal of concrete pavement in excess of six (6) inches thick, and for concrete base course with asphalt surfacing will be determined by field measure of concrete pavement or concrete base course with asphalt surfacing removed.

Item 11

Tree, Protection Fencing 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 tree protection fencing as depicted in plans, and other items necessary to complete the Work, whether specifically mentioned or implied.

Item 12

Relocation of Overhead Electrical Utility to Underground will be paid for at the Contract Unit Price per Lineal Foot (LFT). Price paid will be payment in full for labor, material, and equipment required for the removal of utility linee, as shown on the Plans, or as determined by Landscape Architect, and will include, but is not limited to, removal of pole, removal of attached parts and connections, 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 13

Utility Pole, Remove 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 removal of utility pole, as shown on the Plans, or as determined by Landscape Architect, and will include, but is not limited to, removal of pole, removal of attached parts and connections, 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 14

Parking Lot, Sealing and Striping of the size and shape specified on the Plans, 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 bituminous seal coat and pavement markings and will include, but is not limited to, furnishing, mixing, spreading, dragging, and compacting the bituminous seal coat covering, also furnishing and applying of prime and surface coats, also the preparation of surface, layout, applying proposed pavement word and/or symbol markings, also glass beads, also the protection of existing improvements, barricading, restoration, and other items necessary to complete the job, whether specifically mentioned or implied.

Measurement for bituminous seal coat of the number of course specified will be determined by field measure of bituminous seal coat in place.

Item 15

Parking Lot, Barrier-Free Sign 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 required for furnishing and installing signs, and will include but is not limited to, signs, sign posts, supports, attaching devices, hardware, layout, removing old post and supports, and items necessary to complete the job, whether specifically mentioned or implied.

Measurement for signs will be in square feet, determined by field measure. The transfer and installing of existing signs and posts, and the removal of existing signs and post will be incidental to the Project.

Item 16-17

Sidewalk and Sidewalk Ramp, Concrete, of the type and thickness specified on the Plans, 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 sidewalks and sidewalk ramps and will include, but is not limited to, excavation, construction, protection of existing improvements, undercutting and backfilling the subgrade, compacting and fine grading subgrade, furnishing, placing, and compacting backfill and subbase, construction of expansion joints, also forming, placing, jointing, finishing and curing the concrete, construction of detectable warning, providing protection against rain and cold weather, barricading, restoration, and other items necessary to complete the job, whether specifically mentioned or implied.

Measurement for sidewalks, sidewalk ramps, and driveway approaches will be determined by field measure of sidewalks, sidewalk ramps and driveway approaches in place. Sidewalk ramps will be measured from back of curb to the key flag or to the end of the monolithic rolled curb, whichever is less.

Item 18

Plaza, The Labyrinth Company Round Classical Paver KitPlaza Paver Labyrinth of the size, type, and material 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 to install slope pavers and will include, but is not limited to, geotextile fabric, dewatering, protection of existing improvements, construction of header, installation, staking, backfilling, topsoil, seed, mulch, limestone, and other items necessary to complete the job, whether specifically mentioned or implied.

Measurement for pavers will be determined by field measure of pavers in place.

Item 19

Decorative Gravel Walk, Crushed Limestone 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 construction of an aggregate drive, compacted in place, and will include, but is not limited to, excavation, protection of existing improvements, furnishing, placing, and compacting backfill and subbase, compacting and fine grading subgrade, furnishing and applying chemical additives and water, barricading, and for items necessary to complete the job, whether specifically mentioned or implied.

Measurement for aggregate drives will be in square yards, as determined by field measurement. If the width of the approach is increased to accommodate Contractor’s operation, the additional material installed beyond the width specified on the Plans or as determined by Landscape Architect, will be at Contractor's expense.

Item 20-21

Landscape Edging, Corten Steel of the type 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 to furnish and install steel landscape edging, and will include but is not limited to, preparation, layout, excavation, installation, furnishing and installing stakes, pins, connectors, bending to desired radius, protection of existing improvements, and other items necessary to complete the job whether specifically mentioned or implied.

Measurement for steel landscape edging will be in linear feet determined by field measure of the completed work.

Item 22

Removable Bollards will be paid for at the Contract Unit Price on an Each basis. Price paid will be payment in full for constructing bollards of the number and type specified in the Contract Documents and illustrated on the Contract Drawings. Work will include, but is not limited to furnishing and installing piles, bollard, anchor rods and plates, fasteners, concrete, concrete reinforcement, bearing plates, grouting, and other items necessary to complete the job, whether specifically mentioned or implied to provide complete and functional bollards.

Item 23

Site Electrical Service, 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 the installation and commissioning of 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, connection and removal 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 24

Lightmart Windsor Pole Kit w/ Lantern will be paid for at the Contract Unit Price on a Each basis. Price paid will be payment in full for procurement and installation of arbor, as shown on the Plans, or as determined by Landscape Architect, and will include, but is not limited to, installation of footings; sub-base; arbor; protection of existing improvements; and other items necessary to complete the job, whether specifically mentioned or implied.

Item 25

Moon Gate Arbor will be paid for at the Contract Unit Price on a Each basis. Price paid will be payment in full for procurement and installation of arbor, as shown on the Plans, or as determined by Landscape Architect, and will include, but is not limited to, installation of footings; sub-base; arbor; protection of existing improvements; and other items necessary to complete the job, whether specifically mentioned or implied.

Item 26

Remove and Relocate Bench along Woodside Ave will be paid for at the Contract Unit Price per Each. Price paid will be payment in full for removing, storing and reinstalling 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; securing and storing the bench and its attached parts and connections until it can be re-installed; removal and disposal of unsuitable materials; protection of existing improvements; barricading; and items necessary to complete the job, whether specifically mentioned or implied.

Item 27

Install 6' Bench (Provided by Owner), will be paid for at the Contract Unit Price per Each. Price paid will be payment in full for installing the bench, as shown on the plans, or as determined by Landscape Architect, and will include, but is not limited to, installing attached parts and connections; removal and disposal of unsuitable materials; protection of existing improvements; backfilling; barricading; and items necessary to complete the job, whether specifically mentioned or implied.

Item 28

Trash Receptacles will be paid for at the Contract Unit Price on a Each basis. Price paid will be payment in full for procurement and installation of trash receptacles, as shown on the Plans, or as determined by Landscape Architect, and will include, but is not limited to, installation of fasteners; protection of existing improvements; and other items necessary to complete the job, whether specifically mentioned or implied.

Item 29

Trench Drain, of the type, size, and depth 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 trench drain and will include, but is not limited to, excavation,

sheeting, shoring and bracing, dewatering, construction, protection of existing improvements, backfill, sand, bedding, as set forth on the Plans or Specifications, fasteners, connectors, barricading, restoration, and other items necessary to complete the job, whether specifically mentioned or implied.

Item 30

Perforated Underdrain of the type and diameter 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 furnishing and installing connecting piping, connection to storm sewer, sand backfill, stone pipe bedding, protection of existing improvements, pumping and bypassing flow, and other items necessary to complete the job, whether specifically mentioned or implied.

Item 31

Control Structure of the size, type, and material specified will be paid for at the Contract Unit Price per Each. Price paid will be payment in full for labor, material, and equipment required to furnish and install control structure and will include, but is not limited to, excavation, construction, bricks, blocks, PVC pipe, or other materials necessary to install the designated structure, masonry plaster coat, backfill, disposal of unsuitable or excess material, concrete, installation of frame and cover, restoration, and other items necessary to complete the job, whether specifically mentioned or implied.

Item 32

Connection to CB-7000 of the type and diameter 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 connecting the new sewer to an existing manhole, and will include, but is not limited to, excavation, sheeting, shoring, bracing and dewatering, disposal of excess excavated material, tapping existing structure, connection to structure, sand backfill, removal and disposal of unsuitable material, removal of existing flow channel and construction of new flow channel, cleanout of structure, protection of existing improvements, placing and removing stoppers, bulkheads and flumes, pumping and bypassing flow, removal and disposal of debris, and other items necessary to complete the job, whether specifically mentioned or implied.

Measurement for connection to existing manhole will be per each.

Items 33-34

Storm Sewers and Culverts of the type and diameter specified on the Plans, in open cut trench 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 storm sewer pipe and culvert pipe in open cut trench and will include but is not limited to, excavation, sheeting, shoring, bracing, and dewatering, construction, protection of existing improvements, sand backfill, sand, stone or concrete pipe bedding, placing and removing of stoppers and bulkheads, final inspection which includes cleaning, stubs in drainage structures, connection to drainage structures and sewers, end sections, barricading, restoration, cleanup and other items necessary to complete the job, whether specifically mentioned or implied.

Measurement for storm sewers and culverts in open cut trench, will be in place, by length in linear feet, from center to center of end standard manholes, standard catch basins, standard inlets, headwalls, or other standard drainage structures, with no deduction in length for intermediate standard structures. However, where tee manholes or where special bid items, as indicated in Plans and Specifications, having a basis of payment of lump sum, are involved, the measurement will be from the end of the tee manhole or from the end of the special bid item nearest the adjoining drainage structure and the adjoining drainage structure.

Items 35

Stormwater Outlet End, of the type and diameter specified on the Plans, will be paid for at the Contract Unit Price per Each. Price paid shall be payment in full for labor, material, and equipment required for installing end section(s) and shall include, but is not limited to, excavation, construction, dewatering, preparation, protection of existing improvements, stone pipe bedding, sand backfill, riprap, geotextile, reinforcement, mortar, connection to proposed sewer, backfilling, barricading, restoration, and other items necessary to complete the job, whether specifically mentioned or implied.

Item 36

Electric, Plumbing, and Low Voltage Sleeves, 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 installing sleeves, and will include, but is not limited to, sleeve, necessary excavation, sheeting and bracing, shoring, dewatering, backfilling, disposal of excess excavated material, restoration, cleanup, and other items necessary to complete the job, whether specifically mentioned or implied.

Items 37-42

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.

Item 43-48

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.

Item 49 - 63

Grass and Perennial, 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.

Item 64

Corten Planters, 30" Diameter will be paid for at the Contract Unit Price on a Each basis. Price paid will be payment in full for procurement and installation of planters, as shown on the Plans, or as determined by Landscape Architect, and will include, but is not limited to, excainstallation of fasteners; protection of existing improvements; and other items necessary to complete the job, whether specifically mentioned or implied.

Item 65

Irrigation of the size and type specified, 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 installing irrigation system and will include, but is not limited to, excavation, valves, piping, connections, fittings, heads, boxes, and controllers; furnishing and installing new material; removal and disposal of unsuitable materials, furnishing, placing and compacting backfill, protection of existing improvements; restoration, and other items necessary to complete the job, whether specifically mentioned or implied.

Item 66

Lawn Restoration of the type specified will be paid for at the Contract Unit Price per Square Foot (SFT) of area seeded. Price paid will be payment in full for providing labor, material, and equipment, necessary for seeding and will include, but is not limited to, soil preparation, providing topsoil, grading, shaping, placing and spreading topsoil, seeding, mulching, mulch anchoring, fertilizing, discing and harrowing, rolling, watering, mowing, lawn establishment, reseeding and other items necessary to complete the job, whether specifically mentioned or implied. Contractor will seed areas disturbed by Contractor's operations.

Item 67

Bioretention Area, Complete of the type specified will be paid for at the Contract Unit Price on a Lump Sum basis. Price paid will be payment in full for providing labor, material, and equipment, necessary for building and seeding the bioretention area as depicted in plans and will include, but is not limited to, soil preparation, providing planting soil, grading, shaping, placing and spreading planting soil, seeding, mulching, mulch anchoring, fertilizing, discing and harrowing, rolling, watering, stone base layer, seed establishment, reseeding and other items necessary to complete the job, whether specifically mentioned or implied. Contractor will seed areas disturbed by Contractor's operations.

Item 68

Concrete Stage will be paid for at the Contract Unit Price per Square Foot (SFT). Price paid shall be payment in full for labor, material, and equipment necessary for all work, including, but not limited to, excavation, sub-grade preparation, removal and disposal of excess and unsuitable material, furnishing and installing fill material, geotextile filter fabric,

cast-in-place reinforced concrete, columns, footings, concrete lagging, fasteners, and other required to complete the work whether specifically mentioned or implied.

Item 69

Stage Retaining Wall of the type, width and dimensions specified on the plans, will be paid for at the Contract Unit Price per Linear Foot basis. Price paid shall be payment in full for labor, material, and equipment necessary for all work, including, but not limited to, excavation, sub-grade preparation, removal and disposal of excess and unsuitable material, furnishing and installing fill material, geotextile filter fabric, cast-in-place reinforced concrete, columns, footings, concrete lagging, fasteners, and other required to complete the work whether specifically mentioned or implied.

Item 70

Concrete Stairs of the type, width and dimensions specified on the plans, will be paid for at the Contract Unit Price per Square Foot basis. Price paid shall be payment in full for labor, material, and equipment necessary for furnishing and placing cast-in-place concrete structure and shall include, but is not limited to, all excavation, sheeting, shoring and bracing, dewatering, furnishing and installing reinforcement, water stops, embedded items, forming, placing, jointing, finishing, texturing and curing the concrete, admixtures, protection of existing improvements, protection against rain and cold weather, furnishing, placing and compacting granular backfill geogrid reinforcement and geotextile filter fabric, barricading, restoration, and other items necessary to complete the job, whether specifically mentioned or implied.

Measurement for concrete stairs will be determined by field measure of stairway in place.

Item 71

Stair Railing will be paid for at the Contract Unit Price per Linear Foot. Price paid shall be payment in full for labor, material, and equipment necessary for the furnishing and installation of the handrail as shown on the Plans or as determined by Engineer, and shall include, but is not limited to, attached parts, connections and anchorage; 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.

Measurement for railing will be determined by field measure of railing installed.

Item 72

Concrete Retaining Wall will be paid for at the Contract Unit Price per Linear Foot (LFT). Price paid shall be payment in full for labor, material, and equipment necessary for all work, including, but not limited to, excavation, sub-grade preparation, removal and disposal of excess and unsuitable material, furnishing and installing fill material, geotextile filter fabric, cast-in-place reinforced concrete, columns, footings, concrete lagging, fasteners, and other required to complete the work whether specifically mentioned or implied.

Item 73

Concrete Seat Wall will be paid for at the Contract Unit Price per Linear Foot (LFT). Price paid shall be payment in full for labor, material, and equipment necessary for all work,

including, but not limited to, excavation, sub-grade preparation, removal and disposal of excess and unsuitable material, furnishing and installing fill material, geotextile filter fabric, cast-in-place reinforced concrete, columns, footings, concrete lagging, fasteners, and other required to complete the work whether specifically mentioned or implied.

Item 74

Recycled Brick Paver Inlay of the size, 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 install brick pavers and will include, but is not limited to, geotextile fabric, dewatering, protection of existing improvements, installation, staking, backfilling, topsoil, seed, mulch, base material, and other items necessary to complete the job, whether specifically mentioned or implied.

Measurement for brick paver inlay will be determined by field measure of brick paver inlay in place.

Item A-1

Site Sound System of the size and type specified, 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 installing site sound system and will include, but is not limited to, hardware, fasteners, wiring and controllers; furnishing and installing new material; removal and disposal of unsuitable materials,;protection of existing improvements; restoration, and other items necessary to complete the job, whether specifically mentioned or implied.

Item A-2

Projector Pole and Enclosure will be paid for at the Contract Unit Price on a per Each basis. Price paid will be payment in full for installing the projector pole, as shown on the plans, or as determined by Engineer, and will include, but is not limited to, the installation of the specified pole, as well as attached parts, connections anchorage; labor, material, and equipment necessary for furnishing and installing the pole, base material, excavation, subgrade preparation; removal and disposal of unsuitable materials; furnishing, protection of existing improvements; barricading; and other items necessary to complete the job, whether specifically mentioned or implied.

Item A-3

Projector and Enclosure, Mounted to Building will be paid for at the Contract Unit Price on a per Each basis. Price paid will be payment in full for installing the projector pole, as shown on the plans, or as determined by Engineer, and will include, but is not limited to, the installation of the specified pole, as well as attached parts, connections anchorage; labor, material, and equipment necessary for furnishing and installing the pole, base material, excavation, subgrade preparation; removal and disposal of unsuitable materials; furnishing, protection of existing improvements; barricading; and other items necessary to complete the job, whether specifically mentioned or implied.

Item A-4

Rear Wall 10'4 - 4' with laser cut artwork will bwill be paid for at the Contract Unit Price on a Square Foot (SFT) basis. Price paid will be payment in full for proposed wall, as shown on the Plans, or as determined by Landscape Architect, and will include, but is not

limited to, installation of footings; sub-base; decorative stone veneer; protection of existing improvements; and other items necessary to complete the job, whether specifically mentioned or implied.

Item A-5

Decorative Wall, Board on Board Fence with Stone Veneer will be paid for at the Contract Unit Price on a Square Foot (SFT) basis. Price paid will be payment in full for proposed wall, as shown on the Plans, or as determined by Landscape Architect, and will include, but is not limited to, installation of footings; sub-base; decorative stone veneer; protection of existing improvements; 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 Engineer. A minimum three (3) working days' notification to meeting participants will be required.

B. Schedule:

1. Engineer will establish the meeting place, time and date, distribute agenda, notify participants, and administer the meeting. Contractor will notify major Subcontractors.

C. Attendance:

1. The Jefferson Project
2. Engineer
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 The Jefferson Project, Engineer, 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. Engineer 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. Engineer will establish the meeting place, time and date, distribute agenda, notify participants and administer the meeting. Contractor will notify major Subcontractors.

C. Attendance:

1. Engineer
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. Engineer will prepare and distribute copies to participants and the The Jefferson Project 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 Engineer 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 Engineer.

1. Submit proposed Progress Schedules to the Engineer 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 Engineer 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 Engineer.

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 Engineer.

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 Engineer 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 Engineer 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 Engineer.

1. Samples of the Contractor's Application for Payment, Payment Schedule and Engineer's Certificate for Payment forms are included in the Contract Documents and can be obtained in digital format from the Engineer.

2. Copies of these forms, with Project specific information completed by the Engineer, 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 Engineer not more than once per month.

D. Engineer 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 Engineer 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. Engineer will initial or sign Shop Drawings and Product Data submittal and will indicate the status of the Submittal, or requirements for resubmittal. Engineer 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 ENGINEER'S REVIEW

A. Upon receipt of any Submittal defined above, the Engineer 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 Engineer 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 Engineer'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 Engineer’s notes and/or required corrections/deletions/additions indicated thereon;

b. Contractor provides an appropriate response as may be noted by the Engineer.

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 Engineer 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 Engineer for further review.

5. Elements marked "For Record Only" indicate that the Engineer 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 Engineer regarding comments, notes, markings, etc. made by the Engineer, 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 Engineer.

1.11 RESUBMISSION REQUIREMENTS

A. Contractor will make corrections or changes in the Submittals required by Engineer and resubmit. Contractor will indicate any changes which have been made other than those requested by the Engineer.

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 Engineer 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 Engineer 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 Engineer the Project requirements to ensure that the audio/video is adequate for its intended purpose. The Jefferson Project 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 The Jefferson Project.

J. In some instances, audio/video coverage may not be suitable for recording necessary details. In such instances, the The Jefferson Project 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 Engineer will be redone by the Contractor at no additional cost to the The Jefferson Project.

L. Each USB will be properly identified with the Project Title, location, time, and date in a manner acceptable to the The Jefferson Project.

1.14 PHOTOGRAPHS

A. When required in Section 00 42 43 - Proposal or Section 01 11 00 - Summary of Work, furnish the Engineer 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 Engineer in accordance with the methods designated by individual specification Sections and the Contract Documents. Contractor will furnish such facilities as Engineer may require for collecting, storing, and forwarding samples to the designated laboratory. Contractor will furnish the required samples to the The Jefferson Project 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. Engineer 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 Jefferson Project. 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 Engineer. Approval of materials at the producing plant does not constitute a waiver of Engineer'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 Engineer.

1.03 INSPECTING AND TESTING LABORATORY SERVICES

A. Contractor will appoint, employ, and pay for specified services of an independent firm (to be approved by Engineer) to perform inspecting and testing, as required. Included is concrete testing for all structural concrete, inspection and testing for pile foundations, all soil compaction testing, concrete pavement testing and bituminous pavement density testing.

B. The independent firm will perform inspections, tests, and other services specified in individual specification sections and as required by Engineer or The Jefferson Project.

C. Inspecting, testing, and source quality control may occur on or off the project site. Perform off-site inspecting or testing as required by Engineer or The Jefferson Project.

D. Reports will be submitted by the independent firm to Engineer, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.

1. Notify Engineer and independent firm 48 hours prior to expected time for operations requiring services.

2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.

F. Testing or inspecting does not relieve Contractor of performing Work to contract requirements.

G. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by Engineer. Payment for retesting will be paid for by Contractor.

1.04 CERTIFICATION OF MATERIALS

A. At the request of the Engineer, the Contractor will provide the Engineer with certification that the various materials to be used conform to the standards referred to in the Contract Documents.

1.05 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 Engineer.

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 Engineer.

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 Engineer.

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 The Jefferson Project.

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 Engineer, the public safety is in danger or the necessity exists for maintaining traffic, the Engineer 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 Engineer.

2. Contractor will provide the Engineer 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 Engineer 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 Engineer. 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 Engineer.

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 The Jefferson Project 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 The Jefferson Project and Engineer 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 Engineer'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 The Jefferson Project and Engineer. 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 The Jefferson Project and Engineer.

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 The Jefferson Project and Engineer. 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 Engineer, an approved weatherproof building as a field office. The building will be located as directed by the Engineer, in full view of the Work and with at least one (1) window facing construction operations.

B. Engineer’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 Engineer, 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 Engineer 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

1.01 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.

1.02 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.

1.03 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 Engineer 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 Engineer.

1.04 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 Engineer 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 Engineer will determine which will govern.

1.05 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.

1.06 CHANGES IN THE WORK

A. Engineer 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.

1.07 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 Engineer, at the soonest possible time that can be coordinated with other work and seasonal weather demands.

1.08 DEFINITIONS

A. Terms in this Section will be as defined in the “Glossary of Arboricultural Terms” or as modified below.

1. Engineer: Appointed by The Jefferson Project to represent their interest in the review and approval of the work and to serve as the contracting authority with Contractor. Engineer 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 Engineer'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 Engineer.

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.

1.09 SUBMITTALS

A. Arborist Report: Prior to the start of construction, submit, for approval by Engineer, 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. Engineer may inspect the work at any time.

1.11 PRE-CONSTRUCTION MEETING

A. Schedule a Pre-Construction Meeting with Engineer 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 Engineer.

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 Engineer.

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 Engineer.

PART 2 PRODUCTS

2.01 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 Engineer.

2. Cypress mulch is not allowed.

B. Submit product data that product meets the requirements and 2-gallon sample for approval by Engineer.

2.02 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.

2.03 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. Engineermay 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 Engineer.

D. Submit suppliers product data that product meets the requirements for approval.

2.04 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”.

2.05 TREE GROWTH REGULATOR (TGR)

A. Cambistat 25C.

B. Submit suppliers product data that product meets the requirements for approval.

2.06 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.

2.07 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.

2.08 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

3.01 SITE EXAMINATION

A. Examine the site, tree, plant and soil conditions. Notify Engineer in writing of any conditions that may impact the successful tree and plant protections that is the intent of this Section.

3.02 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 Engineer 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.

3.03 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 Engineer'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 Engineer'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 Engineer'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.

3.04 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.

3.05 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 Engineer. 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.

3.06 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 Engineer. 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. Engineerwill 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."

3.07 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 Engineer of any spills, compaction or damage and take corrective action immediately using methods approved by Engineer.

3.08 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 Engineer 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 Engineer 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 Engineer. 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 Engineer. 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 Engineer.

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.

3.09 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 Engineer for fill material under structures, compacted to 95% of the maximum dry density standard proctor. Engineer 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 Engineer.

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 Engineer, 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 Engineer, 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, Engineer 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. The Jefferson Project 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 The Jefferson Project's arborist, or upon the request of Engineer, will be immediately removed by Contractor at no additional expense to The Jefferson Project. 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 The Jefferson Project. 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. The Jefferson Project 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 The Jefferson Project. 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 The Jefferson Project.

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 Engineer'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 Engineer.

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 The Jefferson Project.

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. The Jefferson Project 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 The Jefferson Project.

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 The Jefferson Project to control sediment until final stabilization.

B. Contractor must respond to maintenance or additional work ordered by The Jefferson Project or governing authorities immediately, but in no case, within not more than 48 hours if required at no additional cost to The Jefferson Project.

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 The Jefferson Project and Engineer.

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 Engineer 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

1.01 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.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 11 00 - Summary of Work

B. Section 01 33 00 - Submittal Procedures

1.03 REFERENCE STANDARDS

A. FHWA (SHS) - Standard Highway Signs and Markings; 2004, with Supplement (2012).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Contractor will coordinate with the The Jefferson Project to determine the location(s) of project signage at the project site.

1.05 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.

1.06 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 The Jefferson Project-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 The Jefferson Project-approved areas for Contractor parking.

4. Contractor and subcontractors field trailers.
5. The Jefferson Project's field trailer.
6. Safety signs as required by federal and State of Michigan OSHA and local laws, regulations, codes, standards, rules, and requirements.

1.07 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 The Jefferson Project 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

2.01 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 The Jefferson Project as shown on the Contract Documents.
    b. The Jefferson Project's logo.
    c. Names and titles of The Jefferson Project's key staff or designated personnel.
    d. Names of Engineer.
    e. Name of Contractor.

2.02 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

3.01 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.

3.02 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 The Jefferson Project will be replaced with new at the Contractor’s expense.

3.03 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

1.01 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.

1.02 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.

1.03 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 Engineer.

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 Engineer for further instructions.

1.04 PRODUCTS LIST

A. Submit a complete list of major products to be used within 4 days, if requested by Engineer. The list will include the name of the manufacturer and the installing subcontractor, if applicable.

1.05 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.

1.06 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 Engineer, in advance of startup, a schedule and listing of startup and testing procedures for review by the Engineer. Checklists and diagrams may be required to ensure adequate startup and testing. Engineer 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 The Jefferson Project’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 The Jefferson Project and the Engineer.

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

1.01 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.

1.02 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 Engineer 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 Engineer with a copy of survey documents that relate to construction layout. Provide these documents when Engineer requests, or as they are completed. Engineer may check the documents for accuracy and may require revisions where necessary. The documents become property of The Jefferson Project and will be included in the permanent Project records.

1.03 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 Engineer. Equipment will be checked, tested, and adjusted as necessary in conformance with manufacturer's recommendations.

PART 2 PRODUCTS (NOT USED)

2.01 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

3.01 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 Engineer'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, Engineer 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 Engineer 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 Engineer for approval before beginning widening and reconstruction.

3. On widening, reconstruction, or passing lane projects, obtain Engineer'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 Engineer 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 Engineer 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.

3.02 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 The Jefferson Project.

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. The Jefferson Project 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 Engineer.

b. Establish additional benchmarks needed for construction.

c. Maintain the benchmarks for necessary The Jefferson Project 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 Engineer 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 Engineer 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 Engineer 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, Engineer 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, Engineer will furnish the necessary input data upon Contractor’s request. Engineer 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 Engineer will furnish the output data. The following limitations apply:

a. Engineer will not assume liability for the accuracy of either input or output data.

b. Engineer 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.

3.03 QUALITY ACCEPTANCE

A. Engineer’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 The Jefferson Project 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 Engineer 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 Engineer for review.

1.03 OPERATION AND MAINTENANCE DATA

A. Prior to final inspection or acceptance, Contractor will fully instruct The Jefferson Project'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 The Jefferson Project, Engineer, 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. The Jefferson Project 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 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This section includes administrative and procedural requirements for preparing, submitting, and delivering operations and maintenance (O&M) data by Contractor, including:

1. Manufacturers' operation manuals.
2. Manufacturers' maintenance manuals.
3. Product data, parts lists, and service information.
4. Warranties and service agreements.

1.02 RELATED SECTIONS

A. Section 01 33 00 - Submittal Procedures

B. Section 01 45 00 - Quality Control

C. Section 01 77 00 - Closeout Procedures

1.03 QUALITY ASSURANCE

A. Prepare instructions and data by personnel experienced in maintenance and operation of described products in the Contract Documents.

B. Provide documentation specific to the actual products and systems installed; exclude generic or non-applicable manufacturer literature.

C. Operations and maintenance manuals must be complete and accurate. O&M manuals that include language stating or implying that the manual's content may be insufficient or stating that the manual's content is not guaranteed to be complete and accurate are unacceptable.

D. Each section will clearly identify specific products and components parts and data applicable to installation. Delete or cross out inapplicable information.

1.04 COORDINATION

A. Coordinate preparation of O&M data with subcontractors, suppliers, and manufacturers.

B. Coordinate training activities with The Jefferson Project to minimize operational disruption.

1.05 FORMAT

A. Hard-Copy Manuals:

1. Prepare data in the form of an instructional manual.
2. Binders: Commercial quality, 8-1/2 x 11 inch three D side ring binders with durable plastic covers; 3 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings. Fill binders to no more than 75% capacity.

3. Cover: Identify each binder with typed or printed title "OPERATION AND MAINTENANCE MANUAL"; identify title of Project; Project number (if applicable), Volume number (if applicable), Contractor name and address, and Engineer name and address.
4. Provide tabbed indexes for each separate product and system, with typed description of product and system.
5. Text: Manufacturer's printed data on white, 8-1/2 by 11-inch paper, with folded inserts for oversized sheets.
6. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
7. Provide indexes, Table of Contents, and tabbed dividers identifying content by process flow under specification Section numbers of this Project Manual.

B. Electronic Manuals:

1. Provide a complete, electronic version of each manual in searchable “portable document format” (PDF) format.
2. Organize electronic manuals to match hard-copy content, including bookmarks for documents over 15 pages, hyperlinks, and Table of Contents for ease of navigation.
    a. Within each file, provide bookmarks for the following:
        1) Each chapter and subsection listed in the corresponding printed copy document’s table of contents.
        2) Each figure.
        3) Each table.
        4) Each appendix.
3. Drawings and graphics must be an integral part of the PDF document. All pages must be rotated for clear reading on a computer monitor. Graphic resolution must be adequate to allow the image to be clear on screen and for printing.
4. Name files and folders clearly to identify project name, system, and equipment.
5. Provide electronic files on The Jefferson Project-approved digital media or secure electronic transfer.

1.06 CONTENTS, GENERAL FOR EACH VOLUME

A. Table of Contents: Provide title of Projects and the names, addresses, and telephone numbers of Engineer, Subconsultants, and Contractor in the heading. Provide a schedule of products and systems, indexed to content of the volume. Provide a listing in Table of Contents for design data, with tabbed indexed and space for insertion of data.

B. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

E. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

F. Warranties and Bonds: Bind in copy of each.

1.07 MANUFACTURER'S MANUALS FOR EQUIPMENT AND SYSTEMS

A. The following general information from the manufacturer will be included for the following equipment and systems:

1. Each Item of Equipment and Each System: Provide a description of each unit or system, and component parts with diagrams, charts, capabilities, etc. Identify function, normal operating characteristics, and limiting conditions. Provide performance curves with engineering data and tests, complete nomenclature and model number of replaceable parts, and catalog data or literature with correct model number of equipment noted where literature covers more than one model.

2. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications, either typed or by label machine.

3. Wiring Diagrams: Provide color coded wiring diagrams as installed.

4. Operating Procedures: Provide start-up, break-in, and routine normal operating instructions and sequences. Provide regulation, control, stopping, shut-down, and emergency instructions. Provide summer, winter, and any special operating instructions.

5. Maintenance Requirements: Provide routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions and drawings; and alignment, adjusting, balancing, calibration and checking instructions.

6. Preventative Maintenance Requirements: Provide preventive maintenance recommendations servicing and lubrication schedule, and list of lubricants required. Provide manufacturer's printed storage and installation instructions with alignment instructions and tolerances.

7. Operating Instructions: Provide manufacturer's printed operation and maintenance instructions, as well as a troubleshooting guide for equipment and system components.

8. Controls: Provide a sequence of operation and control diagrams from the controls manufacturer.

9. Parts: Provide original manufacturer's detailed parts list and parts drawing, illustrations, assembly/disassembly drawings and instructions, and diagrams required for maintenance. Provide a cross reference to all individual component manuals for all parts lists and illustrations provide correct parts numbers. Provide a list of all bearing numbers.

10. Spare Parts: Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage and how to obtain them.

11. Coordination Drawings: Provide Contractor's coordination drawings, with color coded diagrams as installed for equipment systems. Provide charts of valve tag numbers, with

location and function of each valve, keyed to flow and control diagrams for each equipment system.

12. Test Reports: Include test and balancing reports as specified in Section 01 45 00 - Quality Control as well as individual specification Sections.

13. Warranty Bonds: Provide a copy of each warranty bond and service contract as applicable, including the date of beginning of warranty or service and maintenance contract, the duration of warranty or service and maintenance contract, proper procedure in case of failure, instances that might affect the validity of warranty, contact information for the maintenance or service contractor. Warranties and maintenance or service contracts must be signed and executed by Contractor or responsible supplier or manufacturer.

14. Additional Requirements: Provide additional information as specified in individual specification Sections.

1.08 INSTRUCTION OF THE JEFFERSON PROJECT'S PERSONNEL

A. Before final inspection, instruct The Jefferson Project's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon times.

B. For equipment requiring seasonal operation, perform instructions for other seasons.

C. Use O&M manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

D. Prepare and insert additional data in individual O&M manuals when the need for such data becomes apparent during instruction of The Jefferson Project's personnel.

E. Refer to individual specification Sections for instruction and training requirements.

1.09 SUBMITTALS

A. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.

B. Submit two (2) copies of completed volumes by the 90% completion level of the project. These copies will be reviewed, and one (1) copy returned to Contractor with Engineer’s comments.

1. Electronic files will be an exact match of the reviewed final paper copy, including organization, formatting and bookmarking.

2. As with the paper copies, in tables showing multiple options, highlight the item provided or cross-out non-applicable information. Cross-out figures and other items showing figures that have not been provided on the project.

C. Quantity Required and Timing of Submittals:

1. For each O&M manual, submit the following:

a. Preliminary Submittal: Submit two (2) printed and bound copies or one (1) electronic file of entire O&M manual, except for test data, service reports, and approved shop drawings for review. Resubmit revised preliminary manuals with corrections and additional requested information.

1) If significant changes are made during startup and testing, submit revised manuals within 30 days 3 of startup.

2) Provide letter that grants to The Jefferson Project the limited right to use and reproduce each manual (in its entirety or any portion thereof) from the respective equipment manufacturer(s). Such limited right will allow The Jefferson Project to use each manual or and portion thereof for:

(a) The potential assembly of a comprehensive facility operation and maintenance manual for the sole benefit of The Jefferson Project; and,

(b) Supplemental training of The Jefferson Project's personnel and operators, over and above the required manufacturer's training, regarding operation of the facility as a system.

b. Final Submittal: Submit three (3) printed and bound copies and one (1) electronic copy of complete O&M manual, including test data and service reports by the manufacturer(s) prior to Substantial Completion of the product or system covered by the O&M data.

D. Copy Quality and Document Clarity:

1. Contents will be original-quality copies. Documents in the operations and maintenance manual will be either original manufacturer-printed documents or first-generation photocopies indistinguishable from originals. If original is in color, copies will be in color. Manuals that contain copies that are unclear, not completely legible, off-center, skewed, or where text or drawings are cut by binding holes, are unacceptable. Pages that contain approval or date stamps, comments, or other markings that cover text or drawing are unacceptable.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 79 23 - INSTRUCTION OF OPERATION AND MAINTENANCE PERSONNEL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Instruct and train The Jefferson Project's personnel in the operation and maintenance of equipment for materials, equipment, and systems furnished and installed under this Contract, including the following items:

1. Process, mechanical, service and other equipment as noted in individual specification Sections.
2. System instrumentation and controls.
3. Primary switchgear.
4. Motor Control Centers (MCCs).

B. Incorporate the following operation and maintenance data and training services into the training program:

1. Shop Drawings.
2. Operation and Maintenance Manuals.

C. Prepare instruction training materials, and student notes/guides for complete classroom and hands-on training of The Jefferson Project's personnel requiring training.

1.02 RELATED REQUIREMENTS

A. 01 33 00 - Submittal Procedures

B. Section 01 60 00 - Product Requirements

C. Section

D. Section

1.03 QUALITY ASSURANCE

A. Preparations of training materials and instruction to be provided as part of Contractor's scope of work will be performed by personnel trained and experienced in maintenance and operation of equipment and systems to be installed under this Contract.

1.04 SCHEDULE OF TRAINING SESSIONS

A. Contractor will coordinate training services with start-up and initial operation of materials, equipment, and systems on days and times, and in manner, acceptable to The Jefferson Project for The Jefferson Project's designated personnel , in accordance with the Contract Documents.

1. Factory training programs, if required, shall be completed at least 30 days prior to startup of materials, equipment, and systems relating to the Project.

2. Field training will be completed no sooner than 15 days before functional testing begins or beneficial use by The Jefferson Project. If after training is completed, and before the project is completed, the systems trained on come out of service for a period of 60 days or longer, Contractor will be responsible for providing additional training to The Jefferson Project's personnel upon the equipment and systems restarting.

    a. Beneficial use (including occupancy) of equipment or a facility is typically defined by Substantial Completion documentation being completed for the Project or if the Contract Documents allow, for a specific piece of equipment, or groups of equipment where there may be multiple Substantial Completion dates in a contract. If none are defined, there is only one Substantial Completion date.

B. Prerequisites to Training:

1. Prepare instructors and training materials and student training materials required for complete factory-, field-, classroom- and hands-on training. These materials are required in addition to those specified in Section 01 78 23 - Operation And Maintenance Data.

C. Training Schedule Submittal:

1. Contractor will prepare and submit proposed training schedule for review and acceptance. The proposed training schedule will show and indicate all training required in the Contract Documents, and will demonstrate compliance with specified training requirements relative to number of hours of training for various elements of the Work, number of training sessions, and scheduling.

2. Submit initial training schedule not less than 60 days before scheduled start of first training session. Submit final training schedule, incorporating revisions in accordance with review comments (if any), not later than 30 days prior to starting the first training session.

3. The Jefferson Project reserves the right to modify personnel availability for training in accordance with process or emergency needs at the facility process or emergency needs at the facility.

1.05 TRAINING FOR MAINTENANCE OF INSTRUMENTATION

A. Train The Jefferson Project's designated personnel as follows:

1. Describe the overall function of the instrumentation furnished and installed under this Contract.

2. Instruct The Jefferson Project's personnel in how to locate the probable source of malfunction, determine the symptoms of the trouble, establish the probable cause and effect a solution.

3. Demonstrate how to conduct appropriate, preventive, and corrective maintenance procedures necessary to keep the instrumentation in proper operating condition, including calibration and testing.

B. Course Materials:

1. Course materials to be used for training The Jefferson Project's personnel will include pertinent portions of the approved submittal(s) specified in the individual specification

Sections such as loop diagrams, calibration data, trouble-shooting guides and maintenance instructions.

C. The training program will not include the time required for system start-up instructions or field acceptance testing.

1.06 TRAINING FOR ELECTRICAL AND MECHANICAL MAINTENANCE

A. Train The Jefferson Project's designated personnel as follows:

1. Describe the functions of the equipment installed under this Contract.

2. Demonstrate preventive and corrective maintenance activities required to keep equipment in good operating condition.

3. Instruct The Jefferson Project's personnel in how to locate the probable source of malfunction, determine the symptoms of the trouble, establish the probable cause and effect a solution.

4. Demonstrate how to conduct appropriate, preventive, and corrective maintenance procedures necessary to keep equipment in proper operating condition, including calibration and testing.

B. Course Materials:

1. Course materials to be used for training The Jefferson Project's personnel to include pertinent portions of the O& manuals as well as alignment tolerances, lubrication schedules, vibration analysis instruction and parameters, trouble-shooting guides and special calibration test and procedures.

C. The training program will not include the time required for system start-up instructions or field acceptance testing.

1.07 OPERATIONAL TRAINING

A. Train The Jefferson Project's designated personnel as follows:

1. Describe the functions of the equipment installed under this Contract, including how the components of a system are controlled together and what the effects of the control methods are on the system and on other upstream and downstream processes installed under this Contract.

2. Implement start-up and shutdown procedures for each piece of equipment individually, as well as the start-up and shutdown of the systems comprising the equipment. This instruction will include normal operation, alternative operations, and emergency operations.

3. Understand the functions of the equipment installed under this Contract, describing the individual components and how each component is used in monitoring and/or controlling equipment and/or processes installed under this Contract.

4. Discuss the operating modes possible as a result of the modifications and installations made under this Contract.

5. Instruct The Jefferson Project's personnel in how to locate the probable source of malfunction, determine the symptoms of the trouble, establish the probable cause and effect a solution.

6. Demonstrate necessary precautions for safe operation of the equipment, instrumentation, and control system installed under this Contract.

7. Demonstrate emergency procedures for equipment and systems installed under this Contract.

B. Course materials to be used for training The Jefferson Project's personnel include pertinent portions of the O&M manuals, including start-up and shutdown procedures; descriptions of equipment and instrumentation functions and modes of operations, control and monitoring; trouble-shooting instructions and process control instructions.

C. Methods of training The Jefferson Project's personnel shall include a field training program at The Jefferson Project 's site consisting of classrooms and hands-on training using The Jefferson Project's equipment and systems.

D. The training program will not include the time required for system start-up instructions or field acceptance testing.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 89 00 - SITE CONSTRUCTION PERFORMANCE REQUIREMENTS

PART 1 GENERAL

1.01 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.

1.02 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

1.03 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

1.04 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 Engineer.

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.

1.05 SUBMITTALS

A. Written permission for the use of disposal and borrow sites must be obtained and copies will be furnished to the Engineer.

1.06 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 Engineer 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 Engineer.

1.07 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.

1.08 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

2.01 GRANULAR MATERIAL

A. Bank run sand must meet the requirements of MDOT, Granular Material Class II.

2.02 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

3.01 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.

3.02 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 Engineer 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.

3.03 EXISTING IMPROVEMENTS

A. Expose existing sewers and structures to which the new Work is to be connected and notify the Engineer once exposed. Engineer 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.

3.04 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 Engineer with satisfactory evidence, in writing, that proper arrangements have been made with the owner of the utility.

3.05 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 Engineer 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 The Jefferson Project.

1. Support provided by the Contractor will be in accordance with and to the satisfaction of the utility company.

3.06 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 Engineer.

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.

3.07 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.

3.08 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 Engineer 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.

3.09 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 Engineer, 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 Engineer.

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 Engineer. 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 Engineer, 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 Engineer 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 Engineer, 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 Engineer, 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 Engineer, 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 Engineer. 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 Engineer, at the Contractor's expense.

3.16 GUARDRAIL

A. Relocate or remove beam guardrail as specified on the Plans or as determined by the Engineer. 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 Engineer.

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 Engineer.

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 Engineer.

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 Engineer 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 Engineer 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 Engineer, needed to restore the disturbed areas to the cross sections called for on the Plans or as determined by the Engineer.

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 Engineer, 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 Engineer, 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 Engineer, 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 Engineer 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 The Jefferson Project, will transport excess excavation to a site(s) designated by the The Jefferson Project.

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 The Jefferson Project, the Contractor will remove and properly dispose of the material at no additional cost to the The Jefferson Project.

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. The Jefferson Project approval of the final site(s) condition in writing will be required prior to final payment authorization.

END OF SECTION

SECTION 02 01 10 - LOCATION AND MAINTENANCE OF EXISTING UNDERGROUND UTILITIES

PART 1 SCOPE OF WORK

1.01 GENERAL

A. Protect existing utilities and improvements not designated for removal and restore damaged or temporarily relocated utilities and improvements to a condition equal to or better than prior to such damage or temporary relocation, in accordance with the Contract Documents.

B. Verify the exact locations and depths of all utilities shown and perform exploratory excavations of utilities that may interfere with the work. Perform exploratory excavations as soon as practicable after award of the contract and, in any event, a sufficient time in advance of construction to avoid possible delays to the Contractor's work. When such exploratory excavations show the utility location as shown to be in error, notify the Engineer.

C. Perform the number of exploratory excavations which is sufficient to determine the alignment and grade of the utility.

1.02 RIGHTS-OF-WAY

A. Do not do any work that would affect oil, gas, water, sanitary sewer, or storm sewer pipelines; telephone, cable television, fiber optic, or electric transmission lines; fences or other structures until Contractor has been notified that the The Jefferson Project has secured authority therefore from the proper party.

B. After authority has been obtained, the Contractor must give said party due notice of its intention to begin work, if required by said party, and remove, shore, support, or otherwise protect such pipeline, transmission line, ditch, fence, or structure, or replace the same.

1.03 PROTECTION OF SURVEY MARKERS

A. Do not destroy, remove, or otherwise disturb any existing survey markers or other existing street or roadway markers without proper authorization. No pavement breaking or excavation will be started until all survey or other permanent marker points that will be disturbed by the construction operations have been properly referenced.

B. Survey markers or points disturbed by the Contractor must be accurately restored after street or roadway resurfacing has been completed.

1.04 RESTORATION OF PAVEMENT

A. General:

1. Replace paved areas, including asphaltic concrete berms cut or damaged during construction, with similar materials of equal thickness to match the existing adjacent undisturbed areas, except where specific resurfacing requirements have been called for in the Contract Documents or in the requirements of the agency issuing the permit.

2. Pavement restoration requirement to match existing sections apply to components of existing sections, including sub-base, base, and pavement.

3. Temporary and permanent pavement must conform to the requirements of the affected pavement owner.

4. Pavements which are subject to partial removal will be neatly saw-cut in straight lines.

B. Temporary Resurfacing:

1. Wherever required by the public authorities having jurisdiction, place temporary surfacing promptly after backfilling and maintain such surfacing for the period of time fixed by said authorities before proceeding with the final restoration of improvements.

C. Permanent Resurfacing:

1. To obtain a satisfactory junction with adjacent surfaces, sawcut back and trim the edge so as to provide a clean, sound, vertical joint before permanent replacement of an excavated or damaged portion of pavement.

2. Trim back damaged edges of pavement along excavations and elsewhere by sawcutting in straight lines.

3. Pavement restoration and other facilities restoration will be constructed to finish grades compatible with adjacent undisturbed pavement.

D. Restoration of Sidewalks or Private Driveways:

1. Wherever sidewalks or private roads have been removed for purposes of construction, place suitable temporary sidewalks or roadways promptly after backfilling and maintain them in satisfactory condition for the period of time fixed by the authorities having jurisdiction over the affected portions. If no such period of time is so fixed, maintain said temporary sidewalks or roadways until the final restoration thereof has been made.

E. Restoration of Curb and Gutter:

1. Wherever curb and gutter have been removed for purposes of construction, place suitable temporary curb and gutter promptly after backfilling and maintain them in satisfactory condition for the period of time fixed by the authorities having jurisdiction over the affected portions. If no such period of time is so fixed, maintain said temporary curb and gutter until the final restoration thereof has been made.

1.05 EXISTING UTILITIES AND IMPROVEMENTS

A. General:

1. Protect underground utilities and other improvements which may be impaired during construction operations, regardless of whether or not the utilities are indicated on the Drawings. Take precautions for the protection of unforeseen utility lines to provide for uninterrupted service and to provide such special protection as may be necessary.

2. Except where the Drawings indicate utilities have been field located during design or certain expose utility locations as part of the work, the Contractor is responsible for exploratory excavations as it deems necessary to determine the exact locations and depths of Utilities which may interfere with its work.

3. Perform exploratory excavations as soon as practicable after Notice to Proceed and, in any event, a sufficient time in advance of construction to avoid possible delays to the Contractor's progress.

4. Notify the Engineer when exploratory excavations show the utility location as shown on the Drawings to be in error.

5. The number of exploratory excavations must be sufficent in number which to determine the alignment and grade of the utility.

6. Costs of locating and repairing damage not due to Contractor's failure to exercise reasonable care, and removing or relocating such utility facilities not indicated in the Contract Documents with reasonable accuracy, and for equipment on the project which was actually working on that portion of the work which was interrupted or idled by removal or relocation of such utility facilities, and which was necessarily idled during such work may be paid for as extra work in accordance with the provisions of Section 00 72 00 - General Conditions. Payment for such work will be at the discretion of the The Jefferson Project.

B. Utilities to be Moved:

1. In case it becomes necessary to move the property of any public utility or franchise holder, such utility company or franchise holder will, upon request of the Contractor, be notified by the The Jefferson Project to move such property within a specified reasonable time.

2. When utility lines that are to be removed are encountered within the area of operations, notify the Engineer a sufficient time in advance for the necessary measures to be taken to prevent interruption of service.

C. Utilities to be Removed:

1. Where the proper completion of the work requires the temporary or permanent removal and/or relocation of an existing Utility or other improvement which is indicated, remove and, without unnecessary delay, temporarily replace or relocate such utility or improvement in a manner satisfactory to the Engineer and the owner of the facility.

2. In cases of such temporary removal or relocation, Contractor will restore or replace the utility or improvement as nearly as possible to its former locations and to as good or better condition than found prior to removal.

D. The Jefferson Project's Right of Access:

1. The right is reserved to the The Jefferson Project and to the owners of public utilities and franchises to enter at any time upon any public street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the work of this Contract.

E. Underground Utilities Indicated:

1. Existing utility lines that are indicated or the locations of which are made known to the Contractor prior to excavation and that are to be retained, and all utility lines that are constructed during excavation operations must be protected from damage during excavation and backfilling and, if damaged, must be immediately repaired or replaced by the Contractor, unless otherwise repaired by the owner of the damaged utility. If the owner

of the damaged facility performs its own repairs, the Contractor will reimburse said owner for the costs of repair.

F. Underground Utilities Not Indicated:

1. In the event that the Contractor damages existing utility lines that are not indicated or the locations of which are not made known to the Contractor prior to excavation, a verbal report of such damage must be made immediately to the Engineer and a written report thereof will be made promptly thereafter. Engineer will immediately notify the owner of the damaged utility. If the Engineer is not immediately available, the Contractor must notify the utility owner of the damage. If directed by the Engineer, repairs will be made by the Contractor. Additional compensation for such work will be at the discretion of the The Jefferson Project.

G. Approval of Repairs:

1. Repairs to a damaged utility or improvement are subject to inspection and approval by an authorized representative of the utility or improvement owner before being concealed by backfill or other work.

H. Maintaining in Service:

1. Unless indicated otherwise, oil and gasoline pipelines, power, and telephone or the communication cable ducts, gas and water mains, irrigation lines, sewer lines, storm drain lines, poles, and overhead power and communication wires and cables encountered along the line of the work will remain continuously in service during construction activities, unless other arrangements satisfactory to the Engineer are made with the owner of said pipelines, duct, main, irrigation line, sewer, storm drain, pole, or wire or cable. Contractor is responsible for and will repair damage due to Contractor's operations, and the provisions of this Section will not be abated even in the event such damage occurs after backfilling or is not discovered until after completion of the backfilling.

1.06 TREES OR SHRUBS WITHIN STREET RIGHTS-OF-WAY AND PROJECT LIMITS

A. General:

1. Except where trees or shrubs or other plantings are indicated to be removed, exercise necessary precautions so as not to damage or destroy trees or shrubs or other plantings, including those lying within street rights-of-way and project limits, and trim or remove trees, shrubs or other plantings unless they have been approved for trimming or removal by the agency having jurisdiction or The Jefferson Project.

2. Existing trees and shrubs which are damaged during construction will be trimmed or replaced by the Contractor or a certified tree company under permit from the jurisdictional agency and/or the The Jefferson Project, at the Contractor's expense. Tree trimming and replacement will be in accordance with the following paragraphs.

B. Trimming:

1. Preserve symmetry of the tree during trimming.

2. Do not leave stubs or splits or torn branches. Make clean cuts close to the trunk or large branches.

3. Do not use spikes for climbing live trees.

4. Coat cuts over 1-1/2 inches in diameter with a tree paint product that is waterproof, adhesive, and elastic, and free from kerosenes, coal tar, creosote, or other material injurious to the life of the tree.

C. Replacement:

1. Immediately notify the agency having jurisdiction and the The Jefferson Project if any tree or shrub is damaged by the Contractor's operations. If, in the opinion of said agency or the The Jefferson Project, the damage is such that replacement is necessary, the Contractor will replace the tree or shrub at Contractor's expense. The tree or shrub will be of a like size and variety as the one damaged, or, if of a smaller size, the Contractor will pay to the owner of said tree a compensatory payment acceptable to the tree or shrub owner, subject to the approval of the jurisdictional agency or The Jefferson Project. The size of the tree or shrub will be a minimum of 1-inch diameter and a minimum of 6 feet in height. Planting of replacement trees and shrubs will be in accordance with the recommendations of the nursery furnishing the plants. Unless otherwise indicated, the Contractor will water and maintain the replacement trees and shrubs for 6 months after planting.

2. The replacement tree or shrub will be of a like size and variety as the one damaged, or, if of a smaller size, the Contractor will pay to the owner of said tree a compensatory payment acceptable to the tree or shrub owner, subject to the approval of the agency having jurisdiction or The Jefferson Project.

   a. The minimum size of the replacement tree or shrub cannot be less than 1-inch diameter nor less than 6 feet in height.

3. Planting of replacement trees and shrubs will be in accordance with the recommendations of the nursery furnishing the plants.

4. Unless otherwise indicated, water and maintain the replacement trees and shrubs for 6 months after planting.

1.07 LAWN AREAS

A. Repair lawn or landscaped areas damaged during construction to match the pre-construction condition to the satisfaction of the land owner and the The Jefferson Project.

1.08 NOTIFICATION

A. Prior to excavation in the vicinity of existing underground facilities, including water, sewer, storm drain, gas, petroleum products, or other pipelines; buried electric power, communications, or television cables; traffic signal or street lighting facilities; and roadway or state highway rights-of-way, notify the respective authorities representing the owners or agencies responsible for such facilities not less than 3 days nor more than 7 days prior to excavation so that a representative of said owners or agencies can be present during such work if they so desire.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 02 41 00 - DEMOLITION

PART 1 GENERAL

1.01 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 The Jefferson Project.

B. Coordinate with the agencies having jurisdiction with regard to requirements and permits.

C. Notify The Jefferson Project 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 The Jefferson Project immediately. Contractor is liable for damage to neighboring property.

L. Provide to The Jefferson Project 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.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 31 23 16 - Structural Excavation and Backfill

1.03 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

1.04 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 The Jefferson Project 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.

1.05 SUBMITTALS

A. Demolition Plan:

1. Submit to the The Jefferson Project 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

3.01 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 Engineer.
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 Engineer. 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 Engineer 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.

3.02 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.

3.03 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 The Jefferson Project 's personnel. Remove all such protection when reconstruction activities are complete, as work progresses, or when directed by the Engineer.

C. Preparation:

1. Notify The Jefferson Project 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 The Jefferson Project and Engineer 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 The Jefferson Project 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 The Jefferson Project.

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 The Jefferson Project or occupants of the facilities.

3.04 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.

3.05 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.

3.06 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

1.01 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.

1.02 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

1.03 DEFINITIONS

A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the The Jefferson Project’s property.

B. Remove and Salvage: Items indicated to be removed and salvaged remain the The Jefferson Project’s property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to the The Jefferson Project’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 The Jefferson Project, items may be removed to a

suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.04 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.

1.05 MATERIAL OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the The Jefferson Project’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.

1.06 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 Engineer'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 The Jefferson Project or the The Jefferson Project'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.

1.07 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.

1.08 PROJECT/SITE CONDITIONS

A. Condition of Facilities: The Jefferson Project assumes no responsibility for actual condition of facilities to be demolished.

B. Occupancy: The Jefferson Project 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 The Jefferson Project’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 The Jefferson Project, 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 The Jefferson Project 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 The Jefferson Project. Provide temporary services during interruptions to existing utilities or schedule work to install interrupted utilities first, as acceptable to the The Jefferson Project.

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 The Jefferson Project's operating areas and construction/demolition areas. Welding and cutting torches producing smoke or toxic fumes must be adequately ventilated.

1.09 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

2.01 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

3.01 EXAMINATION

A. Provide written pre-demolition report to the Engineer 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 Engineer.

a. Pending review of the report by the Engineer, the Contractor will rearrange the selective demolition schedule, and notify the Engineer and the The Jefferson Project as necessary to continue overall job progress without delay.

3.02 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.

3.03 SALVAGE REQUIREMENTS

A. Coordinate with the The Jefferson Project to identify structure and/or building components and equipment required to be removed and delivered to the The Jefferson Project subsequent to demolition.

1. The Jefferson Project 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 The Jefferson Project and obtain signed receipt from the The Jefferson Projectindicating that the The Jefferson Project has received tagged items.

3.04 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 The Jefferson Project'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 Engineer 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.

3.05 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 Engineer.

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 Engineer and at no cost to the The Jefferson Project.

D. Conduct a detailed inspection after patching and repairing has been completed in the presence of the The Jefferson Project and Engineer. 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.

3.06 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 The Jefferson Project.

2. If the Contractor encounters material during removal that is suspected to be potential hazard, stop work immediately and notify the Engineer.

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 Engineer 48 hours after removal from the site.

B. Burning of removed materials from demolished structures is not permitted onsite.

3.07 RECYCLING

A. The Jefferson Project 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.

3.08 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 Engineer or The Jefferson Project, and return adjacent areas to condition existing prior to start of work.

END OF SECTION

SECTION 03 11 00 - CONCRETE FORMING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes formwork for cast-in-place concrete, complete with furnishing, preparation, installation, coating, protection, adjustment, removal and accessories.

1.02 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

1.03 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.

1.04 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

1.05 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

1.06 SUBMITTALS

A. Submit manufacturer's literature for form coating.

B. Submit formwork layout plans, design data and procedures if requested by the Engineer.

1.07 STORAGE AND HANDLING

A. Store and handle form coating to prevent contamination of coating in accordance with manufacturer's recommendations.

1.08 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

2.01 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.

2.02 FORM COATING

A. Utilize nonstaining form oil or alternative mineral oils that will not discolor or adversely affect the concrete.

2.03 FORM TIES

A. Use permanently embedded body type with removable end cones on outer ends, permanently embedded portion 1 inch back from concrete face.

2.04 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.

2.05 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

3.01 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.

3.02 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. Engineer 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.

3.03 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.

3.04 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 Engineer 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 Engineer. 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 Engineer, dependent on air temperatures, cement type, concrete additives or other conditions of the Work in accordance with ACI 347R.

3.05 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 Engineer'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

1.01 SCOPE OF WORK

A. This Section includes joint fillers, joint sealants, waterstops, and miscellaneous embedded items in concrete.

1.02 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

1.03 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

1.04 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 Engineer.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Environmental requirements relative to temperature for placing joint sealants are specified in Part 3 of this Section.

1.06 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

2.01 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.

2.02 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.

2.03 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.

2.04 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

3.01 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.

3.02 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.

3.03 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 Engineer.

3.04 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.

3.05 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.

3.06 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. Engineer 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 The Jefferson Project. Engineer reserves the right to require pullout or shear tests to determine adequacy of anchors, at no extra cost to The Jefferson Project.

3.07 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

1.01 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.

1.02 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

1.03 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 Engineer.

1.04 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 Engineer.

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.

1.05 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

1.06 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.

1.07 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.

1.08 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

2.01 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.

2.02 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.

2.03 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.

2.04 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.

2.05 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

3.01 CONTRACTOR'S VERIFICATION

A. Examine the areas in which the reinforcing steel is to be placed to assure proper lines and levels.

3.02 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.

3.03 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.

3.04 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.

3.05 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 Engineer, 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 Engineer, 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.

3.06 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).

3.07 FIELD QUALITY CONTROL

A. Engineer will inspect the reinforcing steel after installation. Engineer 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

1.01 SCOPE OF WORK

A. This Section includes monolithic cast-in-place concrete work complete with materials, mixes, installation and testing.

1.02 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

1.03 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

1.04 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)

1.05 TESTING AGENCY

A. Inspections and tests required by this Section will be performed by organizations acceptable to the Engineer.

1.06 ALLOWABLE TOLERANCES

A. See Section 03 11 00 for the allowable tolerances for concrete surfaces.

1.07 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 Engineer.

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 Engineer. 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.

1.08 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 Engineer.

1.09 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 Engineer.

B. Submit concrete mixture designs and test data for review by the Engineer. 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 Engineer.

E. Submit a sample concrete delivery ticket for review by the Engineer.

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

2.01 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.

2.02 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.

2.03 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 Engineer 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".

2.04 ADMIXTURES

A. Admixtures approved by the Engineer 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.

2.05 JOINT FILLER

A. See Section 03 15 00 - Concrete Accessories.

2.06 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.

2.07 CURING COMPOUND

A. A curing compound, conforming to ASTM C309 and approved of by the Engineer, may be used to prevent checking, cracking and loss of moisture.

2.08 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 Engineer.
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 Engineer.

F. Proportion cement by weight in bulk, when approved by the Engineer.

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.

2.09 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 Engineer.
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 Engineer 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 Engineer.

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. The Jefferson Project 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 The Jefferson Project. 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

3.01 VERIFICATION OF FORMWORK, REINFORCING, AND SUBGRADES

A. Inspect formwork, reinforcement and subgrades to confirm compliance with the related Work specified elsewhere.

3.02 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.

3.03 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.

3.04 SPECIAL CONCRETE

A. Verify the use and/or locations of watertight concrete and/or high-early strength concrete.

3.05 PREPARATION

A. Notify the Engineer 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 The Jefferson Project.

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.

3.06 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 Engineer. 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.

3.07 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 Engineer.

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.

3.08 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.

3.09 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 The Jefferson Project.

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 The Jefferson Project.

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 Engineer. 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 The Jefferson Project.

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 Engineer 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 Engineer 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 Engineer 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 Engineer, 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 Engineer 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 Engineer.

3.20 DEFECTIVE CONCRETE

A. If, in the opinion of the Engineer, 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

1.01 SCOPE OF WORK

A.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A.

1.03 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.

1.04 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

2.01 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.

2.02 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.

2.03 BOND BREAKER FOR JOINT COMPOUNDS

A. Provide polyethylene tape, coated paper, or metal foil.

2.04 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.

2.05 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.

2.06 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.

2.07 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

3.01 GENERAL REQUIREMENTS

A. Do not omit, add, or relocate construction and expansion joints without acceptance of Engineer.

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 The Jefferson Project.

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.

3.02 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 Engineer.

3.03 PREPARATION OF CONSTRUCTION JOINTS

A. Terminate each day's pour with a construction joint, as shown on the Drawings or as approved by Engineer, 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.

3.04 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.

3.05 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.

3.06 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.

3.07 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.

3.08 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.

3.09 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 The Jefferson Project.

3.10 HYDROPHILIC WATERSTOP

A. Use only where specifically shown in the Drawings or approved by Engineer.

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 05 50 00 - METAL FABRICATIONS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes gratings, railings, floor hatches, lintels, stair nosings, ladders, guardposts, and other miscellaneous items of metal. Not included in this Section are prefabricated metal stairways.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 15 00 - Concrete Accessories

B. Section 03 30 00 - Cast-in-Place Concrete

C. Section 05 12 00 - Structural Steel Framing

1.03 REFERENCE STANDARDS

A. Conform the Work of this Section to the applicable portions of the following Standard Specifications unless otherwise specified.

1. ASTM A36/A36M: Standard Specification for Carbon Structural Steel
2. ASTM A53/A53M: Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
3. ASTM A123/A123M: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
4. ASTM A153/A153M: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
5. ASTM A240/A240M: Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
6. ASTM A276/A276M: Standard Specification for Stainless Steel Bars and Shapes
7. ASTM A500/A500M: Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
8. ASTM A501/A501M: Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
9. ASTM B209/B209M: Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
10. ASTM B221: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
11. ASTM B429/B429M: Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube
12. AISC 303: Code of Standard Practice for Steel Buildings and Bridges
13. AWS D1.1/D1.1M: Structural Welding Code - Steel

14. Federal Specifications (FS)

15. Occupational Safety and Health Act (OSHA)

1.04 DESIGN CRITERIA

A. Design grating, railings, stairs, and hatches to support loads as indicated unless otherwise shown on the Plans.

B. Top rail and supports of Guardrail System:

1. Concentrated load of 200 lbs. applied at any point in any direction.

2. Uniform load of 50 lbs./lft applied to the top rail horizontally with a simultaneous load of 100 lbs/lft 100 lbs. per linear foot (150 kg/m) applied vertically downward.

C. Handrail not serving as top rails:

1. Horizontal concentrated load of 200 lbs. applied at any point.

2. Uniform load of 50 lbs./lft applied at any point.

3. Concentrated and uniform loads need not be assumed to act concurrently.

D. Intermediate rails (all those except handrails), balusters and panel fillers:

1. Horizontal applied normal load of 50 lbf on an area not to exceed 1 sft including openings and space between rails. Reactions due to this loading are not required to be superimposed with those of preceding paragraphs.

E. Gratings, hatches and stairs:

1. Uniformly distributed load of 200 lbs / sft of horizontal surface.

2. Maximum allowable deflection is 1/4 inch with 150 lbs / sft uniformly distributed load or 500 lbs concentrated load applied at midspan,.

F. Design stairways and ladders to conform to the latest federal and state OSHA requirements for loading, rail sizes, and dimensions.

1.05 REQUIREMENTS OF REGULATORY AGENCIES

A. Apply the latest Federal OSHA Standards, as adopted by the State of Michigan, relating to floor and wall openings, grating, stairways, ladders, and skylights to the Work of this specification where applicable.

B. Ensure expansion anchor bolts meet federal and state OSHA requirements for pull-out and shear.

1.06 SUBMITTALS

A. Submit shop drawings showing layout, fabrication dimensions, anchoring details and erection information for stair nosings, ladders, grating and floor hatches. Include pull-out and shear-strength information for recommended anchor bolts.

B. Fabricate and/or erect items before Engineer review of shop drawings at the risk and expense of the Contractor.

C. When requested by the Engineer, submit mill or laboratory certified copies of testing reporting chemical analysis and physical property of metal used in fabrication of items of this Section.

D. Submit affidavits when requested by the Engineer, certifying that the grating, handrail, and ladder capacities comply with the requirements as specified and indicated in this Section or on the Plans.

E. Submit certification that the equipment meets federal and state OSHA standards for Climber Protection.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver miscellaneous metal items in an undamaged condition. Repair or replace damaged items to the satisfaction of the The Jefferson Project at the expense of the Contractor.

B. Store items to permit easy access for inspection and identification. Keep items off the ground, using pallets, platforms, or other supports. Protect unpackaged and packaged items from erosion and deterioration of shop paint or finish surface.

C. Avoid storing on the structure in a manner that could cause distortion or damage to supporting structure members. Perform repair or replacement to the satisfaction of the The Jefferson Project at the expense of the Contractor.

1.08 PROTECTION

A. Protect installed anchor bolts, inserts, and other miscellaneous metal items while other Work is being performed. Repair or replace damaged installed items at the Contractor's expense.

1.09 SEQUENCING

A. Anchors, frames, or other miscellaneous metal items to be embedded in concrete shall be provided on site as required for uninterrupted construction sequence.

1.10 GUARANTEE

A. Ensure the floor hatches bear the manufacturer's 5-year guarantee for proper operation and against defects in materials and workmanship.

PART 2 PRODUCTS

2.01 ZINC COATING

A. Apply zinc coatings to miscellaneous metals as follows unless otherwise indicated on the Plans or specified herein.

1. Steel Shapes, Plates or Bars: ASTM A123/A123M

2. Hardware of Steel or Iron: ASTM A153/A153M

3. Assembled Steel Products: ASTM A123/A123M

2.02 PLATES, SHEETS, SHAPES AND BARS

A. Steel: ASTM A36/A36M

B. Aluminum

1. Plate and Sheet: Alloy 6061, Temper T6, ASTM B209/B209M
2. Extruded Shapes and Bars: Alloy 6061-T6, ASTM B221

C. Stainless Steel

1. Shapes and Bars: ASTM A276/A276M
2. Sheets: ASTM A240/A240M

2.03 TUBING

A. Steel:

1. Hot-Formed Welded and Seamless – ASTM A501/A501M, Grade C
2. Cold Formed – ASTM A500/A500M, Grade C

B. Aluminum: Alloy 6061-T6, ASTM B221

2.04 PIPE

A. Black finish unless otherwise specified, Type E or S, Grade B, Schedule 40, ASTM A53/A53M

B. Aluminum: Alloy 6061-T6, ASTM B429/B429M

2.05 EXPANSION ANCHOR BOLTS

A. In accordance with Section 03 15 00 - Concrete Accessories.

2.06 GRATING AND STAIR TREADS

A. Steel:

1. Minimum 3/16 inch thick bearing bars manufactured from USS "Cor-Ten" Steel with Blaw-Knox Ponbake, Bordon Bo-Ly, or approved equal finish.
2. Provide stair treads with minimum 1 inch wide diamond plate nosings.

B. Aluminum:

1. Use standard rectangular bar manufactured from Alloy 6061-T6, ASTM B221 with standard finish. Provide stair treads with abrasive nosings.

2.07 CONCRETE STAIR NOSING

A. Use ferrous metal tread nosing with an abrasive tread surface. Ensure nosing is a minimum of 1/8 inch thick, with at least 4 inch legs on the horizontal surface of the tread and a 2 inch leg on the vertical surface of the riser, extending the full width of the tread.

B. Integrate nosing with the concrete stairs using steel studs or anchors. Paint nosing with an approved epoxy paint system.

2.08 RAILINGS

A. Use a pipe railing system consisting of top and intermediate rails with posts and kickplates. Use a handrail system for stairs consisting of top and intermediate rails and posts.

B. Use nominal 1-1/2 inch diameter, Schedule 40 aluminum rail and posts. Use extruded aluminum fittings machined to final shape. Use stainless steel fasteners. Fabricate railing systems and handrails with manufacturer's standard concealed mechanical fasteners and fittings for connecting members unless otherwise approved.

C. Use steel rails and posts with a minimum 1-1/2 inch diameter, Schedule 40, black steel pipe of flush welded construction.

2.09 LADDERS

A. Manufacture all items for ladders and associated safety devices from aluminum alloy as stated above with stainless steel anchor bolts unless otherwise noted on the plans.

2.10 HATCHES

A. Mitre frames neatly and provide welded corners and anchors.

B. Shop coat aluminum surfaces that contact concrete, wood, and dissimilar metals with alkali resistant bitumastic paint as specified in Division 9.

C. Provide each access hatch assembly manufactured as an integral unit, complete with all parts and ready for installation.

D. Aluminum access hatches and frames: Fabricate units of continuous welded aluminum construction unless otherwise indicated. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure frames to types of floor or walkway shown on Drawings.

E. Covers: Use mill finish aluminum covers with 1/4-inch diamond pattern, reinforced on the underside. Design covers to open to 90 degrees and lock automatically in that position.

F. Channel Frame: Use 1/4-inch extruded aluminum channel frame with bituminous coating applied to the exterior. Provide full anchor flange and welded anchors around the perimeter for concrete installation.

G. For watertightness, furnish frame with formed gutters a minimum of 3-inch wide by 3-inch deep, anchors, and a welded 1-1/2-inch drain coupling located on the right front corner of the channel frame or in another corner if shown on Drawings or specified otherwise. Fully weld gutter frame for absolute weathertightness.

H. Hinges, Pins, Bolts, and Nuts: Provide covers with heavy 12 gauge, No. 316 stainless steel hinges and stainless steel pins. Ensure hinges pivot so the cover does not protrude into the channel frame. Through-bolt hinges to the cover using stainless steel lock bolts and to the frame using stainless steel bolts and lock nuts.

I. Springs, Tubes, Shoes, Plates, Enclosures, and Operators: Provide covers with manufacturer's standard springs, tubes and caps, tube or spring enclosures, operators, support plates, and shoes. Ensure these components allow ease of operation through the entire 90-degree arc of opening and act as a check to retard downward motion when closing. Design tube and spring enclosures to prevent accumulation of moisture, grit, and debris inside the tube and spring assembly.

J. Hold-Open Arms: Provide covers with hold-open arms and guides that automatically lock the covers in the open position. Install vinyl-covered release handles conveniently located for closing.

K. Interior Snap Lock and Lock Strike: Provide a stainless steel snap lock and lock strike with a stainless steel fixed turn handle and appropriate stainless steel bolts mounted on the underside of the covers.

L. Exterior Lift Handle: Provide the covers with a stainless steel lift handle designed to be flush with walking surface when not in use.

M. Locking and Latching Devices: Provide the covers with the following locking or latching device and related hinged lid, flush gasketed removable screw plug, or threaded cover plug as noted:

1. Equip interior access hatches with removable exterior latch handles and plugs. Provide removable exterior stainless steel latch handles and latch releases protected by flush gasketed removable screw plugs.

2. Equip exterior access hatches with a brass cylinder lock featuring a keyway protected by a threaded cover plug. Provide the lock with the specified cylinder and keys.

N. Hardware Finish: Zinc plate and chromate seal all hardware except where noted otherwise.

O. Accessories:

1. Provide ladder safety posts at fixed ladders and manhole rungs located below access hatches.

a. Design safety posts with telescoping sections that lock automatically when fully extended. Control up and down movement with a stainless steel spring balancing mechanism.

b. Assemble the unit completely with fasteners for securing to ladder rungs following manufacturer’s instructions. Finish to match the ladder served.

c. Use Bilco Ladder Up safety post or an approved equal.

2. Provide fall prevention device below floor doors.

a. Install the fall prevention device as a permanent fall-through prevention system that retracts easily for full access and allows visibility for inspection.

b. Specify the product as FRP or stainless steel Type 316. Design grating to have a live load capacity of 100 pounds per square foot.

2.11 FABRICATION

A. General:

1. Fabricate items to dimensions on plans or Engineer approved shop drawings. Use materials of size and thickness indicated on the Plans or specified herein. Provide all structural members framing into beams or columns, unless otherwise detailed on the Plans, with standard framing connection angles strong enough to develop the full strength of the member, even if design stress is less.

2. Make connections by bolting, welding, or other Engineer approved means. Ensure exposed connections are flush. Grind welds smooth to match and blend with adjoining surfaces.

3. Coat ferrous metal fabrications not to be galvanized or embedded in concrete with a primer as specified in Division 9 of the Technical Specifications or as specified for individual items.

B. Grating and Stair Treads:

1. Fabricate grating with span lengths and panel widths as indicated on the Plans. Space bearing and cross bars evenly to provide the required loading capacity. Make all edges of grating panels solid and flush for the full depth of the grating.

C. Ladders:

1. Fabricate ladders in accordance with the details shown.

2. Provide ladder climbing safety devices such as cages for all ladders 20 feet or greater in length.

D. Lintels:

1. Provide steel lintels for openings as shown and scheduled. Ensure lintels have at least four 4 inches of bearing on each end and add one 1 inch of bearing at each end for each 1 foot of clear span over four 4 feet, unless otherwise shown. Cope horizontal sections of lintels between the edge of the masonry opening and the end of the lintel to allow for a masonry joint not less than one 1 inch deep measured from the interior and exterior faces of the masonry wall.

2. Weld steel plates to structural shapes when used in connection with them.

E. Guard Chains:

1. Use 3/16 inch cadmium plated steel link chains where indicated on the Plans. Provide snap-type fasteners at each end to permit attachment to posts and/or wall eyelets. Install two strands of chain mounted at heights equal to guardrails wherever noted on the Plans.

F. Guard Posts:

1. Use 6 inch diameter steel pipe guard posts conforming to ASTM A53/A53M, Schedule 80, filled with concrete. Use galvanized steel guard posts unless otherwise shown on the plans. Provide the following for guard posts to be painted:

a. 2 to 3 mil polyamide epoxy primer,

b. 2 to 3 mil aliphatic acrylic polyurethane, semi-gloss

c. total dry film thickness 4 – 6 mils

2.12 ACCEPTABLE MANUFACTURERS

A. Steel Grating: Blaw-Knox "Cor-Ten" steel with "Ponbake" finish; Gary Bo-Ly; or equal.

B. Aluminum Grating include: Reliance Steel Products Company; Gary Aluminum Grating, manufactured by IKG Industries; or equal.

C. Floor Hatches include: Babcock-Davis Associates, Inc.; Bilco Company; Halliday Products Inc., or equal.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Install miscellaneous metal items plumb, level, square, and true, set at proper elevations and positioning. Clean bearing surfaces and surfaces to be in permanent contact of all dirt, rust, and other substances before assembling the members.

B. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

3.02 INSTALLATION OF ANCHOR BOLTS

A. Drill holes of diameter and depth recommended by anchor manufacturer. Clean hole of dust and debris before inserting anchor. Assemble anchor and complete installation according to manufacturer recommendations.

3.03 INSTALLATION OF GRATING, AND STAIR NOSINGS

A. Install items at locations indicated on the Plans following manufacturer's recommendations. Embed frames in concrete flush with the finished floor and carefully level to prevent the plates of gratings from rocking.

B. Install stair nosings on all concrete stairs.

C. Install eyelets in walls and/or posts for securing guard chains as indicated on the Plans. Mount chain strands at elevations equal to railings.

3.04 INSTALLATION OF GUARD POSTS

A. Set guard posts a minimum of 42 inch below finished grade in a concrete foundation as shown on the Plans. Extend guard posts 5 feet above finished grade.

3.05 INSTALLATION OF RAILINGS

A. Provide pipe railing system with maximum 8 foot post spacing and minimum 42 inch railing height to top rail. Set top rail of handrailing system at 34 inches high measured from the leading edge of any tread. Maintain minimum 3 inch clearance from the wall for single pipe handrail supported on brackets.

B. Provide removable pipe railings with close-fitting sleeves set in concrete where indicated on the Plans. Make sleeves 1 inch shorter than the thickness of concrete.

3.06 INSTALLATION OF HATCHES AND FLOOR DOORS

A. Comply with manufacturer's instructions for installation of floor, pit, and sidewalk doors.

B. Coordinate installation with Work of other trades.

C. Preparatory Work: For normal flush installation, set frames accurately in position, recessed below the finished grade or floor level with cover face panels plumb or level in relationship to adjacent finish surfaces.

1. If unit is watertight type, unit should be set with slight pitch in direction of drain coupling.

D. Ensure all four corners of the frame lie in the same plane; verify that leaves seat properly on the frame all around. Securely attach units to supports.

E. Pour concrete to the top of the frame for flush installation. Coat aluminum surfaces contacting concrete with bituminous coating before installation.

F. Adjust hardware and covers after installation for proper operation.

G. Remove and replace covers or frames which are warped, bowed, or otherwise damaged.

END OF SECTION

SECTION 05 50 01 - MISCELLANEOUS METAL WORK

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide miscellaneous metalwork and appurtenances, complete and in place, as indicated in accordance with the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 60 00 - Grouting

B. Section 05 55 13 - Wedgewire Screens

1.03 REFERENCE STANDARDS

A. Federal Specifications:

1. MIL-PRF-907F - Antiseize Thread Compound, High Temperature

B. Codes:

1. OSHA 1927.10 - Fixed Ladders

C. Aluminum Association Designation System (AA):

1. AA-M32C22A41 - Aluminum Assn.

D. American Association of State Highway and Transportation Officials:

1. AASHTO HL-93 - Truck Loading

E. American Institute of Steel Construction (AISC):

1. AISC (MAN) - Steel Construction Manual

F. American Society for Testing and Materials (ASTM):

1. ASTM A36/A36M - Carbon Structural Steel
2. ASTM A48/A48M - Gray Iron Castings
3. ASTM A53/A53M - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
4. ASTM A123/A123M - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
5. ASTM A153/A153M - Zinc Coating (Hot-Dip) on Iron and Steel Hardware
6. ASTM A193/A193M - Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Application
7. ASTM A194/A194M - Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service
8. ASTM A240/A240M - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
9. ASTM A276/A276M - Stainless Steel Bars and Shapes

10. ASTM A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
11. ASTM A325 - Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
12. ASTM A500/A500M - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
13. ASTM A992/A992M - Structural Steel Shapes
14. ASTM F593 - Stainless Steel Bolts, Hex Cap Screws, and Studs
15. ASTM F1554 - Anchor Bolts, Steel, 36, 55 and 105-ksi Yield Strength

G. American Nation Standards Institute (ANSI):

1. AWS D1.1/D1.1M - Structural Welding Code - Steel
2. AWS D1.2/D1.2M - Structural Welding Code - Aluminum
3. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel
4. ANSI/AWS QC1 - Standard for AWS Certification of Welding Inspectors

1.04 SUBMITTALS

A. Furnish submittals in accordance with the requirements of Section 01 33 00 - Submittal Procedures.

B. Shop Drawings:

1. Ensure shop drawings conform to AISC recommendations and specifications. They must show holes, and the like, as may be required for other parts of the Work.
2. Shop Drawings must include complete details of members and connections, anchor bolt layouts, schedules for fabrication procedures, and diagrams for the sequence of erection.

C. Anchors:

1. Submit an ICC-ES or IAPMO-UES report listing the ultimate load capacity in tension and shear for each size and type of concrete anchor.
2. Submit manufacturer's recommended installation instructions and procedures for anchors.
    a. Follow these instructions specifically upon review by the The Jefferson Project.
3. No substitution for the indicated anchors will be considered unless accompanied with an ICC-ES or IAPMO-UES report verifying strength and material equivalency.
4. Complete structural calculations and anchorage details must be prepared and submitted by the Contractor for all anchors and anchor groups that are shown but not completely detailed (type, size, location, spacing and embedment) on the Contract Documents. Calculations and anchorage details must be signed and stamped by a Professional Engineer registered in the State of Michigan.

D. Grating:

1. Submit layout drawings for grating, showing the direction of span, type and depth of grating, size and shape of grating panels, seat angle details, and details of grating hold down fasteners.

2. Submit load and deflection tables for each style and depth of grating used.

E. Wedgewire Screens:

1. Coordinate submittals for Wedgewire screen support frames and anchorages with the requirements of Section 05 55 13 - Wedgewire Screens.

1.05 QUALITY ASSURANCE

A. Keep weld procedures and welder qualifications available in the Contractor's field office for review.

B. Welding Special Inspection will be performed by the The Jefferson Project in accordance with the enforceable Building Code.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Carbon Steel:

1. Wide Flange Shapes: ASTM A992/A992M

2. Shapes, Plates, Bars: ASTM A36/A36M

3. Pipe, Pipe Columns, Bollards: ASTM A53/A53M, Type E or S, Grade B standard weight unless indicated otherwise

4. HSS: ASTM A500/A500M, Grade B

B. Corrosion Protection:

1. Unless otherwise indicated, coat fabricated steel metalwork used in corrosive environments and/or submerged in water or wastewater in accordance with Section 09 96 00 - High-Performance Coatings. Do not galvanize it prior to coating.

2. Hot-dip galvanize other miscellaneous steel metalwork after fabrication.

C. Stainless Steel

1. Unless otherwise indicated, fabricate stainless steel metalwork and bolts from Type 316 stainless steel.

D. Aluminum

1. Fabricate aluminum metalwork from Alloy 6061-T6, unless otherwise indicated.

2. Coat contact surfaces of aluminum in contact with concrete, masonry, wood, porous materials, or dissimilar metals in accordance with the requirements of Section 09 96 00 - High-Performance Coatings.

E. Cast Iron

1. Unless otherwise indicated, iron castings must conform to the requirements of ASTM A48/A48M, Class 50B, or better.

2.02 LADDERS

A. Materials:

1. Fabricate ladders entirely from Type 316 stainless steel, unless the Drawings specify otherwise.

2. Pop-Up Extension:

a. Equip every ladder that lacks an exterior handhold with a pop-up extension.

b. The pop-up extension device must be manufactured of the same material and finish as the ladder, and must be provided with a telescoping tubular section that locks automatically when fully extended.

c. Control upward and downward movement with stainless steel spring balancing mechanisms.

d. Assemble units completely with fasteners for securing them to the ladder rungs in accordance with the manufacturer's instructions.

e. Use the LadderUP Safety Post as manufactured by Bilco or an approved equal for the pop-up extension.

2.03 METAL GRATING

A. General:

1. Ensure metal grating is of the indicated design, size, and type.

2. Support grating around an opening by support members.

3. Where grating is supported on concrete, unless otherwise indicated provide embedded support angles that match the grating material and are mitered and welded at their corners.

4. Banding:

a. Completely band the grating at edges and cutouts.

b. Ensure the banding material and cross-section are equivalent to the bearing bars.

c. Weld the banding to each cut bearing bar.

5. Fasten the grating pieces to each support in 2 locations.

6. If grating depth is not indicated, provide grating that remains within allowable stress levels and doesn't exceed a deflection of 1/4 inch or the span divided by 180, whichever is less.

7. Design Loading:

a. For standard duty grating, use a uniform live load of 100 psf or a concentrated load of 1000 pounds when determining stresses and deflections.

b. Determine heavy duty grating stresses and deflections in accordance with AASHTO HL-93.

8. Equip grating with The Intimidator ManLock by McGard or approved equal locking mechanism.
    a. ManLock must use 1/2-inch – 13- 2.75” bolt

B. Material:

1. Except where indicated otherwise, fabricate bar grating entirely of:
    a. Heavy duty welded steel, hot-dipped galvanized after fabrication.
        1) Bearing Bars: Space bearing bars at 15/16 inch center-to-center. Provide bar depth as indicated on drawings.
        2) Cross Bars: Space cross bars at 4 inches center-to-center.
        3) Surface: plain
        4) Loading: HL-93
        5) Finish: hot-dipped galvanized
        6) Fabrication and Tolerances: in accordance with the NAAMM Heavy Duty metal bar Grating Manual
2. Fabricate grating that may be partially or wholly submerged from A316L stainless steel.

2.04 CHECKERED PLATE

A. Provide checkered plate with a pattern of raised lugs on one face and a smooth opposite face.

B. Lugs:

1. Ensure lugs are a minimum of one inch in length and raised a minimum of 1/2 inch above the surface.
2. Orient lugs in a pattern where adjacent lugs are 90 degrees from each other in 2 orthogonal directions.
3. Orient rows of lugs at 45 degrees from the edges of the plates.

C. Where no material is indicated, fabricate the plates from aluminum.

D. Unless indicated otherwise, the minimum plate thickness will be as required to limit deflection resulting from a live load of 100 psf to 1/4-inch, or the span divided by 240, whichever is less.

2.05 IRON CASTINGS

A. General:

1. Ensure iron castings are of uniform quality, free from blowholes, porosity, hard spots, shrinkage, distortion, or other defects.
2. Ensure castings are smooth and well-cleaned by shotblasting.
3. Ensure covers and grates fit together evenly, with the cover flush to the surrounding finished surface. The cover must not rock or rattle when a load is applied.

4. Provide round covers and frames with machined bearing surfaces.

B. Design covers with matching frames for AASHTO HL-93 loading, heavy traffic type, and ensure they conform to the requirements of ASTM A48/A48M, unless indicated otherwise.

2.06 BOLTS AND ANCHORS

A. Standard Service (Non-Corrosive Application):

1. Fabricate bolts, anchor rods, anchor bolts, washers, and nuts from steel as indicated.

2. Form threads on galvanized bolts, rods, and nuts with suitable taps and dies to retain their normal clearance after hot-dip galvanizing.

3. Except as otherwise indicated, steel for bolt material, anchor rods, anchor bolts, and cap screws must be in accordance with the following requirements:

a. Structural Connections: ASTM A307, Grade A or B, hot-dip galvanized

b. Headed Anchor Rods and Anchor Bolts: ASTM F1554, Grade 36, hot-dip or mechanically galvanized with Grade A matching nuts

c. High-Strength Bolts, where indicated: ASTM A325

d. Pipe and Equipment Flange Bolts: ASTM A193/A193M, Grade B-7

B. Corrosive Service:

1. Fabricate bolts, anchor rods, anchor bolts, nuts, and washers in the locations listed below from stainless steel as indicated.

a. Buried locations

b. Submerged locations

c. Locations subject to seasonal or occasional flooding

d. Inside hydraulic structures below the top of the structure

e. Inside buried vaults, manholes, and structures

f. Locations indicated or designated by the The Jefferson Project to be provided with stainless steel bolts

C. Unless otherwise indicated, fabricate stainless steel bolts, anchor rods, anchor bolts, nuts, and washers from Type 316 stainless steel, Class 2. Ensure bolts conform to ASTM A193/A193M and nuts to ASTM A194/A194M.

D. Coating:

1. Protect threads on stainless steel bolts and rods with an anti-seize lubricant suitable for submerged stainless steel bolts, meeting government specification MIL-A-907E.

2. Coat buried bolts in poorly drained soil the same as the buried pipe.

3. Ensure antiseize lubricant is classified as acceptable for potable water use by the NSF.

4. Use "PURE WHITE" by Anti-Seize Technology, Franklin Park, IL, 60131, AS-470 by Dixon Ticonderoga Company, Lakehurst, NJ, 08733, or an approved equal for antiseize lubricant.

E. Bolt Requirements:

1. Use free-cutting steel for the bolt and nut material.

F. Ensure nuts are capable of developing the full strength of the bolts.

1. Ensure threads are Coarse Thread Series, conforming to the American Standard for Screw Threads.

2. Provide bolts and cap screws with hexagon heads, and nuts must be Heavy Hexagon Series.

3. Install bolts and nuts with washers fabricated from material matching the base material of the bolts. Ensure hardened washers for high-strength bolts conform to AISC Specification requirements.

4. Install lock washers fabricated from material matching the bolts where indicated.

5. Ensure each bolt extends at least 1/8 inch beyond the outside face of the nut before tightening. The only exception is anchor bolts, which should be flush with the nut's face before tightening.

G. Adhesive Anchors:

1. General:

a. Use adhesive anchors for drilled concrete or masonry anchors, unless otherwise indicated.

b. No substitutions will be considered unless accompanied with a current ICC-ES or IAPMO-UES report verifying strength and material equivalency.

2. Epoxy Anchors

a. Epoxy adhesive anchors are required for drilled anchors for outdoor installations, in submerged, wet, splash, overhead, and corrosive conditions, and for anchoring handrails and reinforcing bars.

b. Ensure epoxy is in accordance with the requirements of Section 03 60 00 - Grouting.

c. Galvanize threaded rod for general purpose applications. Fabricate it from Type 316 stainless steel for corrosive applications.

d. Do not permit epoxy anchors in areas where the concrete temperature is in excess of 100 degrees F or higher than the limiting temperature recommended by the manufacturer, whichever is lower.

e. Do not use epoxy anchors where they are subject to vibration or fire.

f. Maintain minimum substrate temperatures during the full curing period as required by the manufacturer.

3. Ensure threaded rod is galvanized steel, unless otherwise noted.

H. Expanding-Type Anchors:

1. If your project indicates or permits them, use expanding-type anchors made of galvanized steel, unless specified otherwise. These should be Simpson Strong-Tie Strong-Bolt 2, Hilti Kwik-Bolt TZ, Powers Power-Stud+ SD1 or SD2 anchors, or an approved equivalent.

2. Lead caulking anchors will not be permitted.

3. Minimum size must be as indicated on the Contract Documents.

4. Fabricate non-embedded buried or submerged anchors from stainless steel.

I. Non-Shrink Grouted Anchors

1. Use non-shrink cementitious grout for grouted anchors, if indicated or permitted, in accordance with the manufacturer's recommendations.

2. Use Class B or C non-shrink grout material in accordance with Section 03 60 00 - Grouting.

2.07 IMPACT ANCHOR

A. Use an expansion-type anchor for impact anchors, in which a nail-type pin is driven to produce the expansive force.

B. Provide the pin with a zinc sleeve that has a mushroom-style head and a stainless steel nail pin.

C. Anchors must be Zinc Nailon Anchors, manufactured by Simpson Strong-Tie, Inc., Metal Hit Anchors, manufactured by Hilti, Inc., Rawl Zamac Nailin, manufactured by the Rawlplug Company, or approved equal.

PART 3 EXECUTION

3.01 FABRICATION AND INSTALLATION REQUIREMENTS

A. Fabrication and Erection: Fabricate and erect structural steel in accordance with the American Institute of Steel Construction "Manual of Steel Construction," unless noted otherwise.

3.02 WELDING

A. Method:

1. Perform welding by the metal-arc method or gas-shielded arc method as described in the American Welding Society "Welding Handbook" as supplemented by other pertinent standards of the AWS.

2. Qualify welders in accordance with the AWS Standards.

B. Quality:

1. When assembling and welding, adequately clamp, support, and restrain component parts to minimize distortion and control dimensions.

2. Weld reinforcement will be as indicated by the AWS Code.

3. Upon completion of welding, remove weld splatter, flux, slag, and burrs left by attachments.

4. Repair welds to produce a workmanlike appearance with uniform weld contours and dimensions.

5. Grind sharp corners of material that is to be painted or coated to a minimum of 1/32 inch on the flat.

3.03 GALVANIZING

A. Galvanize structural steel plate's shapes, bars, and fabricated assemblies required to be galvanized, after thoroughly cleaning the steel of rust and scale, in accordance with ASTM A123/A123M.

B. Straighten any galvanized part that warps during the galvanizing operation.

C. After properly cleaning them, galvanize bolts, anchor rods, anchor bolts, nuts, and similar threaded fasteners in accordance with ASTM A153/A153M.

D. Field Repairs:

1. Perform field repairs to damaged galvanizing by preparing the surface and applying a coating.

2. Perform surface preparation by removing oil, grease, soil, and soluble material by cleaning with water and detergent (SSPC-SP 1) followed by brush-off blast cleaning (SSPC-SP 7) over an area extending at least 4 inches into the undamaged area.

3. Apply the coating to at least 3 mils dry film thickness. Use Zinc-Clad XI by Sherwin-Williams, Galvax by Alvin Products, Galvite by ZRC Worldwide, or an approved equal.

3.04 DRILLED ANCHORS

A. Install drilled anchors and reinforcing bars in strict accordance with the manufacturer's instructions.

B. Roughen holes with a brush on a power drill, then clean and dry them.

C. Do not install drilled anchors until the concrete has reached the required 28-day compressive strength.

D. Do not load adhesive anchors until the adhesive has reached its indicated strength in accordance with the manufacturer's instructions.

E. Prior to drilling, locate existing reinforcing steel in the vicinity of proposed holes. Adjust the location of holes to avoid drilling through or cutting any existing reinforcing bars.

F. Fill abandoned drilled holes with epoxy anchor grout.

END OF SECTION

SECTION 26 00 00 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK

PART 1 GENERAL

1.01 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 Engineer 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.

1.02 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

1.03 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

1.04 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.

1.05 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 Engineer.

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 Engineer. 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 _____, _____.

1.06 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.

1.07 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.”

1.08 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 Engineer seven (7) days prior to startup of major electrical system components.

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

A. Witnessed Factory Testing:

1. Some of the specification sections contain factory testing requirements which will be witnessed by the Engineer. 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

3.01 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.

3.02 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 Engineer in writing of any interference between electrical equipment shown on the drawings and other equipment. Obtain Engineer approval for proposed changes before making them.

F. Follow equipment lockout/tagout in strict accordance with The Jefferson Project'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.

3.03 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 Engineer, 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 The Jefferson Project” as the property of the The Jefferson Project unless shown or directed otherwise. Place the equipment in storage on the Plant Site as directed by the Engineer. 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 00 06 - REMOVAL AND DISPOSAL OF EXISTING TRANSFORMERS

PART 1 - GENERAL

1.01 SUMMARY

A. Scope:

1. Contract with a qualified with a qualified and experienced Service Company to test the oil in existing in-service oil-filled transformers to characterize whether the oil contains hazardous concentrations of PCBs.
2. For transformers that contain hazardous concentrations of PCBs, disconnect, remove, and properly dispose of the units.
3. For outdoor transformers, take representative samples of stained concrete slabs and the surrounding soil within 5 feet on all sides beyond the transformer pad.
4. For indoor transformers, take representative samples of stained concrete housekeeping pads.
5. Remove all transformers and associated equipment not characterized as hazardous waste per Specification Section 02 41 13 - Selective Demolition.

B. PCB Concentrations:

1. The oil will be characterized as hazardous waste and disposed accordingly if test results indicate a PCB concentration greater than or equal to 50 parts per million (ppm).
2. Dispose of material with a PCB concentration equal to or greater than 50 ppm as hazardous waste.
3. Characterize equipment within 10 days of final de-energization. Characterize material (soil and concrete) within 10 days of equipment removal. Store no equipment or material characterized as hazardous on-site for more than 30 days.

C. Related Work Specified Elsewhere May Include But Is Not Limited To:

1. Section 02 41 13 - Selective Demolition

1.02 REFERENCES

A. Reference Standards:

1. OSHA: Occupational Safety and Health Administration
2. 29 CFR 1926 - Safety and Health Regulations for Construction
3. RCRA: The Resource Conservation and Recovery Act
4. 40 CFR 761 - Polychlorinated Biphenyls (PCB's) Manufacturing, Processing, Distribution in Commerce and Use Prohibitions.

1.03 SUBMITTALS

A. Submit the permit to transport the transformers from the job site to disposal site.

B. Submit the qualifications and licenses of the Service Company.

C. Submit the licenses, permits, and certifications of the disposal facility.

D. Submit the evidence of insurance for transportation and disposal of PCB/Perchloroethylene cooling liquids and PCB contaminated transformer carcass.

E. Submit removal plan for all transformers and material that is characterized as hazardous waste.

1.04 QUALITY ASSURANCE

A. Service Company must obtain all licenses and permits required by law to engage in the activities described herein. Service Company must provide copies of all licenses and permits including certification that the disposal facility is in compliance with all federal, state and local laws and regulations for the disposal of PCB/Perchloroethylene cooling liquids and PCB contaminated transformer carcass.

B. Service Company must provide copies of required manifests for the transporting the transformers from the site to the disposal site.

C. Title to all transformers, including the liquids, must pass from the The Jefferson Project to the Service Company when the transformers are moved from their present location for loading on the transport vehicle.

D. In the event areas within the plant become contaminated during disposal procedures, the Service Company must arrange for the proper clean up and disposal of all PCB/Perchloroethylene contamination at no additional expense to the The Jefferson Project.

E. Contractor and Service Company must indemnify, keep and save harmless the The Jefferson Project, its agents, officials, employees and consultants against all injuries, deaths, losses, damages, claim, patent claims suits, liabilities, judgments, costs and expenses which may accrue against the The Jefferson Project and in consequence of the granting of this contract or which may result there-from, whether or not it is alleged or determined that the act was caused through negligence or omission of the Contractor, Service Company and/or their employees, of the subcontractor or his employees, if any, and the Contractor and Service Company must, at his own expense, appear, defend and pay all charges of attorneys and all costs and other expenses arising there from or incurred in connection therewith, and if any judgment is rendered against the The Jefferson Project and consultants in any such action, the Contractor must, at his own expense, satisfy and discharge the same. Contractor expressly understands and agrees that any performance bond or insurance protection required by the contract, or otherwise provided by the Contractor, must in no way limit the responsibility to indemnify, keep and save harmless the The Jefferson Project and consultants as herein provided.

1.05 DELIVERY, STORAGE AND HANDLING

A. Temporary on-site storage of the disconnected transformers will not be permitted except for the time (not to exceed 30 calendar days) required by the Service Company to prepare the transformers for loading to their trucks.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CONSTRUCTION

A. Coordinate and schedule transformer removal to be concurrent with associated switchgear and substation work specified elsewhere.

B. Disconnect and remove each transformer after it has been de-energized.

C. The Service Company must load the outdoor transformers and associated PCB contaminated material from their present location to a truck, transport them to an approved disposal facility, decommission each unit per EPA Specifications, incinerate liquids at an EPA approved facility and disassemble and smelt the transformer carcasses at an EPA approved facility.

D. The Service Company must assume the indoor transformers cannot be removed in one piece. The Service Company must perform all necessary procedures when cutting, disassembling, etc. to remove transformers and associated PCB contaminated material, transport them to an approved disposal facility, decommission each unit per EPA Specifications, incinerate liquids at an EPA approved facility and disassemble and smelt the transformer carcasses at an EPA approved facility.

E. Disposal procedures to start immediately following the disconnection of the transformer from the electrical system.

F. Engineer will visually inspect removal of the transformers including PCB testing of transformer and transformer pad area from the site.

END OF SECTION

SECTION 26 05 10 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.01 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.

1.02 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

1.03 SUBMITTALS

A. Submit material lists, shop drawings, and factory test reports for the Engineer'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

2.01 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.

2.02 ACCEPTABLE MANUFACTURERS

A. Only manufacturers recognized as producing new, top quality products meeting applicable standards will be considered acceptable.

B. Engineer 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.

2.03 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. Engineer 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).

2.04 MIXES

A. Mix patches, conduit sealing compound, fire stop compounds, etc., according to manufacturer's recommendations.

2.05 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

3.01 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 Engineer 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 Engineer will be final.

3.02 PREPARATION

A. Keep conduit, fittings, and accessories free of foreign matter. Ream and deburr conduit ends to prevent wire and cable damage.

3.03 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 Engineer'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 Engineer.

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 Engineer.

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.

3.04 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 Engineer and The Jefferson Project before tests are made.

10. Furnish duplicate certified records of all insulation tests to the Engineer.

3.05 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 The Jefferson Project, 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 Engineer and The Jefferson Project.

END OF SECTION

SECTION 26 05 44 - ELECTRICAL HANDHOLES AND MANHOLES

PART 1 GENERAL

1.01 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

1.02 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.

1.03 DEFINITIONS

A. Manhole as used in these specifications refers to both handholes and manholes.

1.04 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.

1.05 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 Engineer asks, provide a list of satisfactory installations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manholes and Handholes:

1. Hartford Concrete Products, Inc.

2. Or Engineer approved equal.

B. Small Handholes (not to exceed 36 inches in either width or length):

1. Hubbell/Lenoir City, Inc./Quazite.

2. Or Engineer approved equal.

2.02 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 Engineer 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 Engineer 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 Engineer 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 Engineer 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 Engineer 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 Engineer 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.

2.03 ACCESSORIES

A. Cable Ties:

1. Non-metallic 3/4-inch strapping tape or nylon straps.

2. Manufacturers:

a. 3M Company

b. Or Engineer approved equal

B. Cable Clamps:

1. Use hot-dip galvanized steel.

2. Manufacturers:

a. Hubbell/A.B. Chance Company

b. Or Engineer approved equal

2.04 FABRICATION

A. Tie pulling irons to concrete reinforcement during manhole fabrication.

PART 3 EXECUTION

3.01 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 Engineer, 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 Engineer.

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. Engineer’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.

3.02 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 Engineer’s approval.

END OF SECTION

SECTION 26 05 53 - ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.01 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

1.02 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

1.03 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 Engineer'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

2.01 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) Engineer 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) Engineer 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) Engineer 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) Engineer 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. Engineer 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) Engineer approved equal
    b. Desktop:
        1) 200M by Brady.
        2) Engineer approved equal
5. Cable Markers:
    a. Portable:
        1) Handimark by Brady.
        2) Engineer approved equal
    b. Desktop:
        1) Labelizer PLUS by Brady.
        2) Engineer 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. Engineer 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. Engineer approved equal

PART 3 EXECUTION

3.01 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 Engineer.

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

1.01 SUMMARY

A. Furnish labor, materials, equipment and incidentals required to provide contactors for non-motor loads as shown on the Drawings, specified or required.

1.02 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***

1.03 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

2.01 MANUFACTURERS

A. The following are acceptable manufacturers:

1. Allen–Bradley
2. Square D
3. Eaton Corporation

2.02 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

3.01 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 26 50 00 - LIGHTING SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Furnish all labor, materials, equipment and incidentals required to provide lighting systems, as shown on the Drawings, specified or required.

1.02 REFERENCES

A. Related Work Specified Elsewhere:

1. Section 01 33 00 - Submittal Procedures

B. Reference Standards:

1. UL 844, Luminaires for Use in Hazardous (Classified) Locations
2. UL 1598, Luminaires

1.03 SYSTEM DESCRIPTION

A. Fixtures to be complete with supports, ballasts, drivers, lamps and incidentals as required including disconnecting and lowering hangers, brackets, and appurtenances where shown and/or specified in the Lighting Fixture Schedule.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's literature, specifications, engineering data and technical information for all lighting fixtures and components furnished under this Section. Lighting fixture construction details and complete ETL photometric curves and isocandle curves must be submitted for approval along with fixture details.

B. Operation and Maintenance Data:

1. Provide O&M Data in accordance with Specification Section 01 33 00 - Submittal Procedures.
2. Submit the following O&M Data:
    a. Schedule of installed Lighting Systems containing voltage, connected panelboard/circuit, luminaire type and wattage, location, and model number.
    b. Installation and Maintenance Manuals.
    c. Finish/Treatment Data.

1.05 COMMISSIONING

A. Install new incandescent and fluorescent lamps in all incandescent and fluorescent fixtures at the time of substantial completion.

1.06 MAINTENANCE

A. Spare Parts:

1. 15% spare lamps of each type and wattage as specified in Part 2 of this Specification.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. As noted on the Lighting Fixture Schedule.

2.02 MANUFACTURED UNITS

A. General: All Lighting Fixtures and components must be UL Listed.

B. Lighting Fixture Schedule: See Drawings.

2.03 COMPONENTS

A. Lamps:

1. Fluorescent:

a. Type F32T8, 3500 K 90 lumens per W (minimum initially), 84 color rendering index (minimum), 4 feet straight. Ensure a minimum lamp life of 20,000 hours at 3 hours per start.

b. Type 54T5HO, 3500K 86 lumens per W (minimum) 45” straight. Ensure a minimum lamp life of 18,000 hours at 3 hours per start.

c. Compact combination twin-tube and ballast, 13 Wt

d. Ensure all fluorescent lamps are low mercury and TCLP compliant.

2. High Intensity Discharge:

a. Metal Halide: Clear, mogul base, for base UP± 15º operation, 90 lumens/watt initial, 80 color rendering index (minimum), 4,200 K color temperature.

3. Incandescent:

a. PAR style: PAR 36, wide flood, 12Y, Tungsten halogen, screw terminal, 4,000 hours rated life.

b. Single ended quartz: 250 watts, T4, DC bayonet base, 2,000 hours rated life.

4. Light Emitting Diode (LED): 3,500K -4,300K color temperature, white, with L70 rated lumen output at 50,000 hours of operation.

B. Ballasts:

1. Fluorescent: High power factor 0.98 (minimum), energy efficient, high frequency (>20 kHz), electronic, reduced harmonics type, equipped with thermal protectors (Type "P" ballast), compatible with lamps installed.

a. Operate ballasts as a parallel circuit. This allows remaining lamps to maintain full light output if one or more lamps fail.

b. Ensure ballasts tolerate sustained open circuit and short circuit output conditions without damage to the ballasts.

c. Use Universal "Triad" Type B232I120EL, B432I120EL ballasts, or equal.

2. High Intensity Discharge:
    a. Metal Halide (MH) Types:
        1) High power factor, constant wattage, pulse start, autotransformer with line starting current the same or less than operating current.
        2) Low temperature - minus 20 degrees C reliable lamp starting
3. Achieve a "C" sound rating (minimum) for ballasts. Ensure ETL/CBM certification for all ballasts.
4. All ballasts to be capable of operating on power systems having up to 7% harmonic distortion factor present on the power lines.
5. Ballasts to have special features as specified in lighting fixture schedule.
6. Spare Parts: 15% spare ballasts of each type and wattage

C. Photocell:
1. Cadmium sulfide cell, 1/2 inch diameter
2. Translucent Lexan dome which screens out ultraviolet rays
3. Conduit mounting
4. Time delay to prevent false switching
5. Built-in failsafe to ON position
6. Contact: SPST, normally closed, rated to handle 2000 W tungsten or 1800 VA ballast load.
7. Light level selector, turn-on at 1-5 fc; turn off at 3-15 fc
8. Manufacturers:
    a. Tork
    b. Or Engineer approved equal

D. 7-Day Timer: [NTS: Alternate see below]
1. 1 channel, 7 day programmable timer with 8 on/off events.
2. Individual programs for each day of the week.
3. 120 VAC
4. Contact: SPST dry contact, rated for 16A, 120 VAC resistive
5. DIN rail mounting
6. Manufacturers:
    a. Tork, DIN100B
    b. Or Engineer approved equal

E. 7-Day Timer: [NTS: Alternate see above]

1. Mechanical timer with 24-hour dial and day omitting feature.
2. 120 VAC
3. Contact: DPDT dry contact, rated for 40A, 120 VAC Resistive.
4. Manufacturers:
    a. Tork, 7200Z
    b. Or Engineer approved equal

F. Lighting Contactor:

1. 6-pole, 600V, electrically held, 120V operating coil, NEMA 4 enclosure.
2. Contacts to be silver-cadmium-oxide, 30 ampere fluorescent, 20 ampere tungsten rated, double break.
3. Manufacturers:
    a. Square D, Class 8903, Type L
    b. General Electric Class 360
    c. Or Engineer approved equal

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Fixture mounting heights and locations indicated on the Drawings are approximate and are subject to revision in the field where necessary to clear conflicts and obstructions.

B. Suspended Fixtures:

1. Pendant mount using 3/4-inch conduit stems.
2. Ground to outlet box
3. Attach mounting to building structure with expansion anchors.
4. Do not use conduit and associated hardware used to support fixture for wiring.

C. Surface Mounted Fixtures: Attach to appropriate outlet box using suitable fixture studs or swivel stem hangers.

D. Independently support fixtures mounted in dropped ceiling grids from the building's structural system. Do not rely on any portion of the grid or its support systems.

E. Mounting Heights: Mounting heights or locations (if designated on the Drawings) are to bottom of the fixture or to centerline of device unless otherwise noted.

F. Install in accordance with manufacturers recommendations.

G. Do not use fixtures to support any portion of suspended ceilings.

H. Recessed fixtures are to be supported at all 4 corners.

I. All fixtures are to be mounted straight, plumb and true to building lines.

J. When mounting fixtures to split face masonry, use a back box to ensure fixture is installed plumb. Grind down split face to ensure proper plumb install.

END OF SECTION

SECTION 26 54 00 - MISCELLANEOUS EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Furnish all labor, materials, equipment and incidentals required to provide miscellaneous equipment as specified and shown on the Drawings.

1.02 REFERENCES

A. Reference Standards:

1. National Electrical Manufacturers Association (NEMA):

a. NEMA IA 10030, Industrial Control and Systems: Enclosures.

B. Related Work specified elsewhere

1. Section 01 33 00 - Submittal Procedures

1.03 SUBMITTALS

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

A. Non-hazardous location alarm horns:

1. Non-hazardous location alarm horns:

a. Rated NEMA 4X.

b. Required Features:

1) 120 VAC power

2) Volume: 100 dB

3) Die-cast zinc with gray enamel finish

4) Stainless steel diaphragm

5) Stainless steel hardware

6) Manufacturer:

(a) Federal Signal - Model 350WB with PR (single) or PR2 (double) projector

(b) Edwards Signaling Products - 876 Series with 872-PO projector

(c) Or Engineer approved equal

2. Hazardous location alarm horns

a. Rated NEMA 4X and rated for use in Class I, Division 1, Group D location.

b. Required Features:

1) 120 VAC power

2) Die-cast aluminum housing with stainless steel diaphragm

3) Stainless steel hardware

4) Manufacturer:

(a) Federal Signal - Model 31X

(b) Or Engineer approved equal

B. Strobe Lights:

1. Non-hazardous location Strobe Lights:

a. Provide strobe light, NEMA 4X, with mounting bracket and outlet box.

b. Required Features:

1) Rate: 80 flashes per minute

2) Lens: Fresnel lens of Lexan

3) Power: 120 VAC

4) Color: Red, blue, amber, green or clear as indicated on Drawings.

5) Enclosure: Die cast aluminum housing with stainless steel hardware and polycarbonate dome

c. Provide 1 extra lamp per strobe light.

d. Strobe:

1) Federal Signal - Model 371DST

2) Edwards Signaling Products - 94 Series

3) Or Engineer approved equal

2. Hazardous location Strobe Lights:

a. Provide strobe light, NEMA 4X, with mounting bracket and outlet box rated for use in Class I, Division 1, Group D hazardous areas.

b. Required Features:

1) Rate: 65 flashes per minute

2) Enclosure: Utilize a copper-free aluminum enclosure with a powder epoxy finish. Ensure all exposed hardware consists of Type 316 stainless steel.

3) Power: 120 VAC

4) Color: Red, blue, amber, green or clear as indicated on Drawings.

5) Glass dome with dome guard

6) Ceiling, wall, or stanchion mount as required

c. Provide 1 extra lamp per strobe light

d. Strobe:

1) Edwards Signaling 116 Series

2) Or Engineer approved equal

3. Bracket: Stainless steel backplate with cold rolled sheet bracket arms.

a. Wall Mount:

1) LWMB2 by Federal Signal

2) WBR by Edwards Signaling Products

b. Corner Mount:

1) LCMB2 by Federal Signal

2) CBR by Edwards Signaling Products

3) Or Engineer approved equal

PART 3 EXECUTION

3.01 INSTALLATION

A. Install alarm devices 15 feet above finished grade or at locations shown, specified or required.

END OF SECTION

SECTION 31 11 00 - CLEARING AND GRUBBING

PART 1 GENERAL

1.01 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.

1.02 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

1.03 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 Engineer.

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

3.01 CLEARING

A. Trees, stumps, brush, hedges, and other vegetation occurring within the contract limits as defined on the Plans or as directed by the Engineer shall be cut off flush with the ground and shall be completely removed.

3.02 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 Engineer, 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 Engineer .

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 Engineer.

3.03 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 Engineer.

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.

3.04 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 Engineer.

3.05 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 Engineer. Trees and stumps buried in these areas shall have a minimum cover of 2 feet.

3.06 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 Engineer.

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.

3.07 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 Engineer 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 Engineer 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 Engineer 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

1.01 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.

1.02 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

1.03 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 Engineer.

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.

1.04 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

2.01 GRANULAR MATERIAL

A. Class II granular material meeting the requirements of MDOT Section 902.

2.02 AGGREGATE BASE COURSE

A. 21AA dense graded aggregate conforming to MDOT Section 902.

PART 3 EXECUTION

3.01 SITE GRADING

A. Grade sites as specified on the Plans or as determined by the Engineer. 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 Engineer as not to be removed.

3.02 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 Engineer 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 Engineer 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 Engineer.

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.

3.03 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 Engineer with written permission from the property owner of the stockpile location before starting stockpiling operations.

3.04 ROUGH GRADING

A. Grade the site as needed to comply with the Plans or as directed by the Engineer. 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.

3.05 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 Engineer. 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.

3.06 ADJUST STRUCTURES

A. Adjust structures as called for on the Plans or directed by the Engineer. 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 Engineer.

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 Engineer.

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.

3.07 RECONSTRUCT STRUCTURES

A. Reconstruct structures as called for on the Plans or as determined by the Engineer. 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 Engineer.

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 Engineer.

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 Engineer.

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 13 - SUBGRADE PREPARATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes preparing subgrade for pavement construction complete with excavation, embankments, proof rolling, subgrade undercut and backfill, subgrade stabilization fabric, subbase, right-of-way ditching, right-of-way restoration, field quality control, and appurtenances.

1.02 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 19 - Dewatering

G. Section 32 31 00 - Fences and Gates

H. Section 32 92 19 - Seeding

1.03 REFERENCE STANDARDS

A. Conform the Work for this Section to the applicable portions of the following Standard Specifications, unless otherwise specified:

1. ASTM D1557: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))

2. ASTM D4491/D4491M: Standard Test Methods for Water Permeability of Geotextiles by Permittivity

3. ASTM D4533/D4533M: Standard Test Method for Trapezoid Tearing Strength of Geotextiles

4. ASTM D4751: Standard Test Methods for Determining Apparent Opening Size of a Geotextile

5. ASTM D4632/D4632M: Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

6. ASTM D6241: Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile- Related Products Using a 50-mm Probe

7. American Association of State Highways and Transportation Officials

8. Michigan Department of Transportation (MDOT), Standard Specifications for Construction, latest edition.

1.04 ALLOWABLE TOLERANCES

A. Shape the finished subgrade surface to conform to plan grade and cross section within a tolerance of 1 inch in 10 feet.

1.05 SUBMITTALS

A. Test Reports:

1. Testing lab must provide the Engineer with two (2) certified copies of the sieve analysis of the backfill material.

2. Perform testing of the material and certify the test results through a testing laboratory approved by the Engineer.

3. Testing lab must provide the Engineer with two (2) certified copies of the compaction and moisture tests of the backfill and subgrade materials.

4. Use a testing laboratory approved by the Engineer to perform testing of the materials and certify the test results.

B. Samples:

1. Submit sample of the proposed subgrade stabilization fabric measuring not less than 1 syd in area, and the manufacturer’s certification that the proposed fabric meets or exceeds the requirements listed in Part 2 of this Section.

2. Make submissions no later than 10 working days before any installation.

1.06 PRODUCT DELIVERY STORAGE AND HANDLING

A. Furnish and store geotextile fabric in a wrap that protects it from ultraviolet radiation and abrasion. Cover the geotextile with the aggregate base as per plan within two (2) weeks of placement.

1.07 SOIL EROSION AND SEDIMENTATION CONTROL

A. Provide, maintain, and remove temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or as determined by the Engineer.

B. Implement measures to 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 areas stripped of vegetation, including material stockpiles.

D. Comply with requirements of Section 01 57 13.

PART 2 PRODUCTS

2.01 GRANULAR MATERIALS

A. Ensure Granular Material conforms to the requirements for Class II granular material as specified in MDOT Section 902.

2.02 AGGREGATE MATERIALS

A. Use crushed limestone, natural aggregate, blast furnace slag, or crushed concrete for undercut backfill, meeting the requirements of 21AA, 21A, or 22A as specified in MDOT Section 902. Ensure crushed concrete is free of all steel and other deleterious materials.

2.03 SUBGRADE STABILIZATION FABRIC

A. Compose subgrade stabilization fabric of synthetic fibers formed into a woven fabric. Use fibers made of 85% propylene or ester polymers. Ensure the geotextile conforms to the following requirements listed below:

Property	Test Procedure	Test Result
Grab Tensile	ASTM D4632/D4632M	270 lbs. (min)
Elongation	ASTM D4632/D4632M	15% (min)
Trapezoidal Tear	ASTM D4533/D4533M	100 lbs. (min)
CBR Puncture Strength	ASTM D6241	900 lbs. (min)
Apparent Opening Size	ASTM D4751	40 – 70 U.S. Sieve
Permittivity	ASTM D4491/D4491M	0.05 per sec (min)

2.04 SEPARATOR FABRIC

A. Furnish geotextiles of either woven or nonwoven polyester, polypropylene, stabilized nylon, polyethylene, or polyvinylidene chloride. Geotextile must have the minimum required strength values in the weakest primary direction. Contractor may use nonwoven geotextile that is one or a combination of the following:

1. Needle punched, heat bonded, or resin bonded

B. Furnish a manufacturer's certified report of test or analysis that shows the geotextile delivered meets the requirements of this specification to the Engineer at least 15 days before use in the Work. Mark the delivered geotextile to clearly identify it with the applicable test report furnished to the Engineer.

C. If using sewn seams, furnish a field sewn seam sample produced from the geotextile and thread sewn with the equipment that will be used on the project, before incorporating into the work.

D. Furnish geotextile conforming to the following physical properties:

Test	Method	Value
Minimum grab tensile strength	ASTM D4632/D4632M	170 lb
Minimum puncture strength	ASTM D6241	350 lb
Maximum apparent opening size	ASTM D4751	No. 70 sieve
Minimum permittivity	ASTM D4491/D4491M	0.35 s-1

1. Numerical values represent minimum/maximum average roll values. Average test results from all rolls in a lot must conform to the tabulated values.

PART 3 EXECUTION

3.01 REMOVING STRUCTURES

A. Remove structures and sewers as called for on the Plans or as determined by the Engineer. Perform removal or abandonment of structures in accordance with Section 01 89 00.

3.02 HOLES

A. Replace earth removed during any phase of excavation or removal operations that results in a hole or void by backfilling to the proposed subgrade with suitable Granular Material approved by the Engineer.

B. Compact material to 95% of its maximum unit weight.

C. Furnish, place, and compact the backfill material at the Contractor's expense.

3.03 SALVAGING AND STOCKPILING TOPSOIL

A. Remove topsoil, within the grading limits for cuts and where the fill is less than 5 feet in height to the top of the proposed road, to the depth and width specified on the Plans.

B. Do not remove topsoil from peat and muck areas.

C. Topsoil salvaged in excess of that required by the Plans will be disposed of by the Contractor at Contractor's expense.

D. Remove and salvage topsoil in accordance with Section 31 22 00.

3.04 PREPARING ROADWAY SUBGRADE

A. Remove, displace, or otherwise treat muck, peat, and other unsuitable material within the roadway as shown on the Plans or as directed by the Engineer.

B. Remove deposits of frost heave material within lines 2 feet outside the proposed roadbed to a depth of 3 feet below the surface of the earth grade, unless otherwise shown on the Plans or as determined by the Engineer.

C. Remove ice and snow from the surface of the ground before placing the embankment.

D. Dispose of muck, peat, frost heave material, and other unsuitable material outside the highway limits or spread them uniformly in low places beyond the roadway limits when approved by the Engineer.

E. Plow or scarify old road surfacing, gravel, crushed stone, or other nonrigid type surfacing occurring within the roadbed area and underlying proposed embankment less than 1 foot in depth, that is not salvaged or incorporated in the new Work, full depth. Spread and compact it to form a uniform foundation before placing any new embankment.

F. Break up, remove, and dispose of old pavement and other rigid structures occurring within the roadbed area and underlying the proposed embankment less than 1 foot in depth that are not incorporated into the new Work.

3.05 SUBGRADE

A. Excavate and smooth the area to be paved to the line, grade, and cross section indicated on the Plans.

B. Compact the subgrade between the lines 2 feet on either side of the proposed edge of pavement or curb to 95% of the maximum unit weight for a depth of 7 inches by rolling with a roller weighing not less than 10 tons.

C. Complete subgrade ahead of placing forms or paving a distance equal to one day's average paving operation. Shape and compact the subgrade to the Plan cross section by approved mechanical means before the paving operation.

3.06 PAVEMENT EXCAVATION

A. Perform pavement excavation to construct the earth grade and its appurtenances true to the lines, grades, and cross sections called for on the Plans and in accordance with these Specifications.

B. Include the following items in excavation, any or all of which may be included or incidental: remove trees, stumps, hedges, roots, culverts, sewers, miscellaneous structures; perform roadway excavation; remove asphalt or concrete pavements, curbs, curb and gutters, sidewalks, end headers; remove aggregate surfaces; salvage and stockpile topsoil; perform subgrade undercut; excavate for structures; trim and finish earth grade; perform fine grading, right-of-way ditching and restoration; and dispose of unsuitable material.

C. Completely remove large stones, trees, stumps, brush, shrubs, logs, matted roots, other vegetation, and debris occurring between lines 3 feet outside the grading limits or as otherwise shown on the Plans. Properly dispose of them as specified in Section 31 11 00.

D. Excavate earth and other existing materials to the full depth and width of the cross section shown on the Plans. Excavate material sufficiently to set forms or slip-form equipment. Limit excavation to 3,000 linear feet of right-of-way unless additional lengths are requested in writing and approved by the Engineer.

E. Remove excess excavated material from the project by the Contractor along approved routes to disposal sites approved by the The Jefferson Project. Consider disposal of excess excavation and maintenance of the dump sites incidental to the price paid for excavation and perform as specified in Section 01 89 00.

3.07 BORROW EXCAVATION

A. Consider materials secured from locations outside the project limits for completing embankments and other items as borrow excavation. Subject borrow pits and materials to removal to inspection by the Engineer. Secure borrow pits and materials by the Contractorunless otherwise provided.

B. Measure borrow excavation by volume in cubic yards compacted in place, based on the neat lines called for on the Plans or authorized by the Engineer. Perform all regular excavation and grading with existing materials for any designated area to facilitate accurate measurement of borrow quantities, unless otherwise specified in the Contract Documents. Have the Engineer cross section these areas prior to furnishing and placing the required borrow material. Have the Engineer resection the completed area and compute the volume of borrow material in its compacted-in-place state. Do not measure or compute borrow material placed beyond the neat lines called for on the Plans or not authorized by the Engineer in writing as borrow excavation. Reject measurement of borrow material by truck count.

C. Maintain public and private roads used between the source of borrow and the Project at the Contractor's expense, including repairs of any damage caused by Contractor's operations. Apply a dust palliative when necessary, as determined by the Engineer.

3.08 EMBANKMENTS

A. Construct embankments with sound earth. Deposit and compact the materials by either the Twelve Inch Layer Method or the Controlled Density Method. Use the Controlled Density Method unless the Twelve Inch Layer Method or another method is specifically called for on the Plans.

B. Strip topsoil from the entire fill area. Remove topsoil to the depth shown on the Plans or determined by the Engineer. After removing topsoil, compact the entire area for embankment construction to not less than 90% of the maximum unit weight, to a depth of 9 inches.

C. Carefully place material where stones are prevalent so that all large stones distribute well and crevices fill completely with smaller stones, earth, sand, or gravel to form a solid embankment. Do not place rock or fragmental material of a size that prohibits placement in layers of the specified depth in the embankment. Do not place stones over 3 inches in diameter within 12 inches of the surface of the earth grade within the areas between lines 2 feet outside the edges of the proposed roadbed.

D. Do not place frozen material in the embankment, nor place the embankment upon frozen material.

E. Construction requirements for the two (2) methods of placing and compacting embankments are as follows:

1. Twelve-Inch Layer Method:

    a. Deposit and spread the material in layers not more than 12 inches deep, loose measure, parallel to the finished grade and extending to the full width of the embankment. Deposit the material by operating the conveying equipment over the layer being placed, as far as feasible.

    b. Compact each layer to not less than 95% of the maximum unit weight at the existing moisture content. Continue compacting until each layer reaches the required density across its full width.

2. Controlled Density Method:

    a. Deposit and spread embankment material in layers not more than 9 inches deep, loose measure, extending to the full width of the embankment. Spread and compact granular material in layers not more than 15 inches thick if the specified density is obtained.

    b. Use material for embankments of 5 feet or less and the bottom 4 feet of embankments of more than four 4 feet above the ground surface with no more than the optimum moisture content at compaction time.

    c. Use material for the embankment more than 5 feet above the ground surface with a moisture content not greater than 3% above optimum at compaction time, except keep the moisture content of the top 3 feet of the embankment at or below optimum.

F. If granular material is used to construct the embankment, ensure the moisture content is below saturation.

G. If the material contains an excess of moisture, ensure it is dried to the required moisture content before being compacted.

H. Compact each layer of material containing the required moisture to not less than 95% of its maximum unit weight, unless otherwise specified, before starting the succeeding layer.

I. Change the method of operation when the original ground, any section of compacted embankment, or the soil in cut sections becomes rutted or distorted by the Contractor's equipment. Reshape and recompact all rutted or distorted areas at the Contractor's expense before placing any succeeding layers.

3.09 ROUGH GRADING

A. Contractor shall rough grade as close as possible to finished subgrade leaving a minimum to be removed in fine grading.

B. Remove any excavated material stored along the line of Work between curb and sidewalk on improved lawns within 48 hours. Leave lawns or other improved areas in a neat and clean state within the specified 48 hours.

C. Keep the Work area free of water during the excavation operation, including placement of the subbase. Provide and maintain a dewatering system at the Contractor's expense. Keep the dewatering system in operation until paving is completed.

3.10 PROOF ROLLING

A. After removal of topsoil or other overburden and after construction of embankments, proof roll the existing subgrade with six passes of a minimum 15 ton pneumatic-tired roller. Operate the roller in a systematic manner to assure the number of passes over all areas, and at speeds between 2.5 and 3.5 miles per hour.

B. Make one-half of the proof rolling passes under structures in a direction perpendicular to the other passes.

C. Perform proof rolling in the presence of the Engineer. Undercut material showing rutting or pumping, as determined by the Engineer, and replace it with the appropriate fill material.

D. Perform proof rolling only when weather conditions permit. Do not proof roll wet or saturated subgrades.Replace materials degraded by proof rolling a wet or saturated subgrade, as determined by the Engineer, at no cost to the The Jefferson Project. Notify the Engineer 3 days prior to proof rolling.

3.11 SUBGRADE UNDERCUT EXCAVATION

A. Unsuitable subgrade excavation must be the operation of:

1. removing unsuitable soils as determined by the Engineer, below the level of the ground after topsoil has been stripped in fill areas where the embankment is to be 5 feet or less in height to plan grade, or;

2. the removal of unsuitable soils below the subgrade elevation, as determined by the Engineer in cut areas after the subgrade has been established.

B. In fill areas, after topsoil has been stripped in accordance with this Section, the Engineer will inspect the embankment area to certify the adequacy of the native soils and to determine the extent of any additional excavation of unsuitable soils prior to placing the first lift of the embankment.

C. In cut areas after the subgrade elevation has been established by the mass grading operation, the Engineer will inspect the subgrade to determine the extent of any additional excavation of unsuitable soils.

D. Backfill areas excavated of unsuitable material with non-frost heaving material similar to adjacent soil, unless otherwise specified in the Contract Documents. Backfill excavation with MDOT Granular Material, Class II, and provide drainage in areas with free water due to seepage as determined by the Engineer. Compact backfill to not less than 95% of the maximum unit weight, unless otherwise specified.

3.12 SUBGRADE STABILIZATION FABRIC

A. Place Subgrade Stabilization Fabric on prepared subgrade or subbase in the manner and at the location as called for on the plans. Lay the fabric smooth and free of tension stress, wrinkles, or creases.

B. Place fabric strips to provide a minimum overlap of 24 inches for each joint. Position fabric so the upper strip overlaps the next lower strip.

C. If the geotextile sustains damage during construction, repair the torn or punctured section by placing a fabric piece large enough to cover the damaged area plus 24 inches beyond to adjacent undamaged geotextile in all directions.

3.13 GEOTEXTILE SEPARATOR FABRIC

A. Before placing the geotextile, smooth, shape, and compact the subgrade to the required grade, section, and density. After placing the geotextile on the subgrade, do not allow traffic or construction equipment to travel directly on the geotextile.

B. Roll the geotextile out on the roadway and pull taut manually to remove wrinkles. Join separate pieces of geotextile by overlapping or sewing. Place the geotextile in the overlapped joints so it overlaps at least 18 inches.

C. Engineer may require the use of weights or pins to prevent the wind from lifting the geotextile.

D. After placing, do not expose the geotextile longer than 48 hours before covering.

E. Place backfill material over the geotextile by back dumping with trucks and leveling with a crawler dozer. Do not use construction equipment that causes ruts deeper than 3 inches. Fill ruts with additional material. Do not smooth ruts without adding additional material. Cover damaged areas with a patch of geotextile using a 3 foot overlap in all directions.

3.14 TRIMMING AND FINISHING EARTH GRADE

A. After constructing the earth grade to the required grade, remove all stones and rocks more than 3 inches in diameter appearing on the subgrade surface.

B. Trim earth grade and subgrade to the grade called for on the Plans. Trim subgrade requiring a subbase or base course to the established grade within ± 0.1 foot. Trim subgrade without a subbase or base course to the established grade within ± 3/4 inch.

C. Trim the earth grade outside the subgrade, smooth all irregularities, and complete the entire site or roadway to the required lines, grades, and cross sections. Finish backslopes and fill

slopes as either Class A or Class B slopes. Require Class A slopes unless otherwise specified in the Contract Documents.

1. Class A Slopes:

    a. Finish Class A slopes to the average slopes shown on the Plans, allowing no variations exceeding 0.1 foot above or below the established grade measured at right angles to the slopes.

2. Class B Slopes:

    a. Finish Class B backslopes to the average slopes shown on the Plans, allowing no variations exceeding 0.5 foot above or below the established grade measured at right angles to the slope.

    b. Finish Class B fill slopes to within 0.2 foot of the established grade and cross section from the outside shoulder line for a distance of 3 feet down the slope. Ensure the remainder of the completed fill slope conforms to the requirements for Class B backslopes.

3. Obtain the degree of finish of the slopes from machine operations. Do not require the smoothness of surface finish ordinarily associated with template, string line, or hand operations, but do not permit abrupt variations.

4. Remove debris except sod, leaf mold, and rotted forest litter. Break or remove loose clods of earth extending beyond the specified slope tolerance.

5. Where waste earth or other surplus material is deposited on fill slopes, the slopes may be flattened or otherwise altered as directed by the Engineer, to produce a uniform cross section which blends with the topography and presents a pleasing appearance.

D. Round the tops of backslopes, bottoms of fill slopes, and all other angles in the cross section lines to form vertical curves as shown on the Plans or as determined by the Engineer, where trees or other restrictions do not interfere. Make transitions in length of vertical curves gradual to present a uniform and attractive appearance. Omit vertical curves when constructing ditches in peat.

3.15 SUBBASE

A. Spread and compact Granular material for subbase evenly as specified in MDOT Section 301.

B. Determine the thickness of each layer placed by the required density obtained, but do not exceed 15 inches in depth, loose measure.

C. Construct the subbase to the alignment, grade, and cross section shown on the Plans. Cease operation immediately if the subgrade becomes soft or unstable causing rutting, or if subgrade material forces up into the subbase during placing. Remove and dispose of the mixed material. Correct the subgrade and place and compact new subbase material. Consider this Work incidental to the construction of the Project.

3.16 SCARIFY, RE-GRADE AND COMPACT EXISTING SUBGRADE

A. Scarify the existing subgrade (base) to a depth of 9 inches within the limits as shown on the plans. Reshape the subgrade to the cross section shown on the plans and compact it to 95% of its maximum unit weight by rolling with a roller weighing not less than 10 tons.

3.17 ROADWAY DITCHING

A. Construct ditching at the locations called for on the Plans or as determined by the Engineer. Shape the ditch by machine grading or another method approved by the Engineer to achieve the cross section, line, and grade shown on the Plans.

B. Dispose of the excess material from ditch construction by the Contractor at Contractor's expense.

C. Grade the ditch section to receive topsoil and seed.

1. Conform topsoil, seed, fertilizer, and mulch to the requirements specified on the Plans and in Section 32 92 19.

D. Furnish, place, and compact any additional material needed to construct the ditch at the location and cross sections called for on the Plans, at Contractor's expense.

3.18 RIGHT-OF-WAY RESTORATION

A. Restore the right-of-way in accordance with the type and location specified on the Plans. Shape the right-of-way by machine grading or another method approved by the Engineer to achieve the cross section, line, and grade shown on the Plans.

B. Dispose of excess material from the right-of-way restoration operation by the Contractor at Contractor's expense, as specified in Section 01 89 00.

C. Grade the right-of-way to receive topsoil and seed.

1. Conform topsoil, seed, fertilizer, and mulch to the requirements specified on the Plans and in Section 32 92 19.

D. Furnish, place, and compact any additional fill meeting the Engineer's approval, needed to construct the right-of-way to the cross sections called for on the Plans, at Contractor's expense.

3.19 MACHINE GRADING

A. Perform machine grading consisting of light grading that generally utilizes excavation from ditches and roadbed to shape shoulders and adjacent shallow fills. Use a blade grader or similar equipment. Apply machine grading on the sections shown on the Plans or specified in the Contract Documents.

B. Include all necessary scarifying, plowing, discing, moving, and shaping of the earth to develop the cross section shown on the Plans.

C. Make ditches conform reasonably close to the line and grade shown on the Plans or as directed, and drain runoff waters to outlets shown on the Plans or designated by the Engineer.

D. Finish the roadbed to grade using a blade grader or equivalent equipment.

E. Grade intersections, approaches, entrances, and driveways as shown or directed, excluding loading and hauling of earth as part of this Work.

3.20 MAINTENANCE AGGREGATE

A. Furnish and install MDOT 21A, 21AA or 22A maintenance aggregate to maintain pedestrian and traffic access. Place and compact aggregate to maintain access in areas determined by the Engineer.

B. Maintenance aggregate will be incidental to the Project unless otherwise specified in the Contract Documents.

3.21 TESTING

A. During the course of the Work, the Engineer may require testing for compaction, sieve analysis and moisture content of the backfill and subgrade materials.

B. Have a testing laboratory suitable to the The Jefferson Project and approved by the Engineer perform sampling and required testing.

C. Engineer must determine the location and number of samples to be made. ve the testing laboratory furnish the Engineer with two (2) certified copies of the results of all tests.

D. Conform testing procedures to current MDOT Standards for Construction .

E. Understand 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 D, modified to include all the material passing the 1 inch sieve.

3.22 DEFECTIVE WORK

A. Correct any portion of the backfill, subbase, or subgrade deficient in specified density by methods approved by the Engineer.

B. Charge any extra testing or sampling required by the Engineer due to deficiencies to the Contractor's expense.

END OF SECTION

SECTION 31 23 16 - STRUCTURAL EXCAVATION AND BACKFILL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes excavation for structures, removal and disposal of excavated materials, backfilling, backfill materials and compaction.

1.02 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 19 - Dewatering

F. Section 32 92 19 - Seeding

1.03 REFERENCE STANDARDS

A. Conform the Work for this Section, unless otherwise specified, to the applicable portions of the following Standard Specifications:

1. ASTM D1557: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3)

2. American Association of State Highway Transportation Officials

3. Michigan Department of Transportation (MDOT), Standard Specifications for Construction, latest edition

1.04 SUBMITTALS

A. Have the testing laboratory provide the Engineer with two (2) certified copies of the backfill compaction test results. Perform compaction testing and certification by a testing laboratory approved by the Engineer.

1.05 SOIL EROSION AND SEDIMENTATION CONTROL

A. Provide, maintain, and remove temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or determined by the Engineer.

B. Prevent surface runoff from carrying excavated materials into waterways, reduce erosion of slopes, and prevent silting of waterways downstream of the Work.

C. Measures should include provisions to reduce erosion by the wind of areas stripped of vegetation, including material stockpiles.

D. Comply with requirements of Section 01 57 13.

PART 2 PRODUCTS

2.01 GRANULAR MATERIALS

A. Make granular material conform to the requirements for Class II, as specified in MDOT Section 902. Use natural bank run sand for granular material.

2.02 COARSE AGGREGATE

A. Make coarse aggregate conform to the requirements for 6A, as specified in MDOT Section 902.

PART 3 EXECUTION

3.01 DEWATERING

A. Dewater the area within the vicinity of the new Work in accordance with Section 31 23 19 prior to the excavation operation.

B. Ensure the depth of dewatering allows the excavation to remain dry during the construction of the structure, including excavating, backfilling, and compacting operations.

3.02 SHEETING, SHORING, AND BRACING

A. Furnish, place, and maintain sheeting, shoring, and bracing of the excavated area at all times to ensure the safety of workmen and protect the new Work or adjacent structures, including pavement, curbs, sidewalks, pipelines, and conduits next to or crossing the excavated area, as well as the safety of pedestrian and vehicular traffic.

B. Take responsibility for the complete design of all sheeting, shoring, and bracing Work. Design the system to suit soil conditions, with sufficient strength, quality, dimension, and spacing to prevent caving, loss of ground, or squeezing within the neat lines of the excavation, and to effectively restrain movement of adjacent soil.

C. Submit Plans for sheeting, shoring, or bracing Work to the Engineer for informational purposes only before installation.

D. Make sheeting, shoring, bracing, and excavation conform 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. No extra compensation will be paid to the Contractor for sheeting, shoring or bracing left in place unless otherwise indicated in the Proposal.

F. Make supports for pipes, conduits, etc., crossing the excavated area conform to the requirements of the owners of such facilities, and leave them in place if necessary.

G. Provide, place, maintain, and remove sheeting, shoring, and bracing materials at the Contractor's expense unless otherwise indicated in the Proposal.

H. Do not remove sheeting, shoring, or bracing until the structure attains sufficient strength to support external loads.

I. Prevent sheeting, shoring, and bracing material from contacting the structure, and install them to avoid transmitting concentrated loads or horizontal thrusts to the structure.

3.03 COFFERDAMS

A. Maintain, install, and remove a cofferdam as a substantially watertight enclosure, well-point system, or similar system that permits construction of the substructure above seal or subfooting in dry conditions and without damaging the Work.

B. Alternate methods, where used in lieu of cofferdams, will be permitted by authorization only. Such authorization will be considered only after receipt of a permit from all federal, local or State agencies with jurisdiction for the alternate method.

C. Stream diversion and earth dikes, where used in lieu of cofferdams or a well-point system will be permitted by authorization only. Such authorization will be considered only after receipt of a permit from all federal, local or State agencies with jurisdiction for such construction.

D. Make interior dimensions of cofferdams sufficient to provide clearance for constructing forms, inspecting their exteriors, and permitting dewatering outside the forms.

E. Right or enlarge cofferdams, caissons, or cribs tilted or moved laterally during sinking to provide necessary clearance.

F. Do not brace cofferdams to substructure forms. Construct cofferdams to protect the Work in place from damage by high water and prevent foundation injury by erosion.

G. Prevent timber bracing from extending into or remaining in the finished concrete.

H. Remove cofferdams without disturbing or marring the finished concrete. Leave cofferdam sheeting in place when called for on the Plans or when necessary in the Work.

I. Provide, construct, maintain, and remove cofferdams, including pumping, at the Contractor 's expense.

J. Take responsibility for any claims for damages resulting from electing to use a well-point system or similar system.

3.04 EXCAVATION

A. Include site clearing and grubbing, excavating and disposing of all encountered materials, supporting and protecting all structures and/or utilities above and below the ground surface, and removing water from the construction site in excavation.

B. Include removal of existing structures, as shown on the Plans or determined by the Engineer, in excavation.

C. Perform rock excavation, if applicable, as part of the excavation according to specifications contained elsewhere.

D. Keep excavation operations within reasonable close conformity with the location and grade of each structure.

E. Temporarily store excavated materials to avoid damage to trees, shrubs, fences, improvements, utilities, private property, or traffic. Do not place excavated materials in locations that endanger excavation banks by imposing loads.

F. Make the excavation large enough to allow construction of the new Work, placement and compaction of backfill, and dewatering operations.

G. Take special care not to disturb excavated surfaces, other than rock, where concrete will bear. Perform final removal of foundation material to grade just before placing the concrete.

H. Do not place concrete until checking the excavation depth and reviewing the suitability of foundation material with the Engineer.

I. Excavated material, determined by the Engineer as suitable for backfill may be used.

J. Dispose of excess materials at the Contractor's expense, as specified in Section 01 89 00.

K. Make changes to footing bottom elevations as necessary to ensure a satisfactory foundation. Review any required changes with the Engineer before proceeding.

L. Clean all rock or hard material surfaces of loose fragments and cut them to a firm surface before placing concrete. Make the surface level, stepped, or serrated, as shown on the Plans.

M. Remove unsound material underlying proposed structures and replace it with granular material approved by the Engineer, in layers not exceeding 6 inches in depth. Compact each layer to 95% of maximum unit weight unless indicated otherwise on the Plans, or within these specifications.

3.05 BACKFILL

A. Place backfill material only after the Engineer inspects the new Work and backfill material.

B. Do not place backfill against any portion of the new Work until completing required curing, surface finishing, and waterproofing. Avoid placing backfill that creates unequalized horizontal loading until the concrete reaches at least 70% of its design strength. Place required backfill on opposite sides at the same time to equalize horizontal loadings.

C. Use granular material for backfilling within 3 feet of all manholes, chambers, valve wells, valve boxes, other pipeline structures, footings, piers, abutments, columns, walls, foundations, etc., unless otherwise indicated in the Contract Documents.

D. Backfill spaces excavated and not occupied by the new Work or specified backfill material with suitable material from the excavation.

E. After placing and compacting backfill to the flow line elevation of any weep holes indicated on the Plans, cover the back end of each weep hole with no less than 2 cubic feet of coarse aggregate.

F. Exclude large stones, boulders, broken rocks, concrete, and masonry from backfill.

G. Carry backfill up to the surface of adjacent ground or to the elevation of proposed earth grade, and neatly grade its top surface. Trim fills around all new Work to the lines shown on the Plans or as directed by the Engineer.

3.06 COMPACTING BACKFILL

A. Place all backfill behind and around the new Work in layers not exceeding 9 inches in depth, and compact to at least 95% of maximum unit weight.

B. Compact areas where density does not affect construction, as determined by the Engineer, to at least 90% of maximum unit weight.

C. Place backfill material as specified in MDOT Section 206.03.B, except for the following modifications. Ensure moisture content does not exceed 3% above optimum at the time of compaction. Dry material to required moisture content before installation if it contains excess moisture.

D. Compact each layer containing the required moisture to at least 95% of maximum unit weight before starting the succeeding layer, unless otherwise specified on the Plans or authorized by the Engineer.

E. Consider compaction of backfill incidental to the Work of backfilling, including all soil manipulation to achieve specified densities, with no separate payment. No additional compensation will be allowed for any delay required to obtain the specified moisture content or the specified density.

3.07 CLEANUP

A. Remove and dispose of excess material immediately after placing and compacting backfill at the Contractor's expense, as specified in Section 01 89 00.

B. Grade the construction area and leave it in a neat, workmanlike condition.

C. At a seasonally correct time, rake the disturbed area, place topsoil, fertilize, and restore according to the requirements of Section 32 9219.

3.08 TESTING

A. During the Work, perform testing for backfill compaction or density as required by the Engineer. Have a testing laboratory approved by the Engineer take samples and conduct the testing.

1. Charge the cost for testing and sampling to the The Jefferson Project.

B. Have the testing laboratory furnish the Engineer with two (2) certified copies of all test results. Conform testing procedures to current MDOT's Standard Specifications for Construction.

C. Understand 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 A, for Granular Materials, and Method C for all other soils.

3.09 DEFECTIVE WORK

A. Correct any portion of the backfill deficient in specified density by methods approved by the Engineer. Charge any extra testing or sampling required due to apparent deficiencies to the Contractor's expense.

END OF SECTION

SECTION 31 23 33 - TRENCHING AND BACKFILLING

PART 1 GENERAL

1.01 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.

1.02 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

1.03 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

1.04 TEST REPORTS

A. Testing laboratory must provide the Engineer 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 Engineer.

1.05 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.

1.06 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 Engineer.

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

2.01 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.

2.02 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.

2.03 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 Engineer's approval.

2.04 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

3.01 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.

3.02 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 Engineer.

C. Excavate the trench in reasonably close conformity with the lines and grades specified on the Plans or as established by the Engineer.

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 Engineer. 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 Engineer 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.

3.03 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 Engineer 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.

3.04 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.

3.05 BACKFILLING TRENCHES

A. Place backfill material on sections of bedded pipes only after receiving approval from the Engineer 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 Engineer.

C. Do not perform backfilling in freezing weather except by permission of the Engineer. 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 Engineer. 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 Engineer.

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 Engineer.

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.

3.06 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.

3.07 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 Engineer, 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.

3.08 FIELD TESTING

A. Conduct testing for compaction or density of the backfill during the Work when required by the Engineer. Perform sampling and testing through a testing laboratory suitable to the The Jefferson Project and approved by the Engineer.

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.

3.09 DEFECTIVE WORK

A. Correct any portion of the trench backfill deficient in the specified density using methods approved by the Engineer.

B. Charge additional testing or sampling required due to deficiencies to the Contractor's expense.

END OF SECTION

SECTION 32 01 90 - MAINTENANCE OF PLANTED AREAS

PART 1 GENERAL

1.01 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.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 32 90 00 - Plantings

B. Section 32 92 19 - Seeding

1.03 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 The Jefferson Project at least 24-hours in advance of performing onsite maintenance activities.

2. A written summary of the maintenance activities will be submitted to Engineer 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

3.01 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 Engineer 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 Engineer or The Jefferson Project, furnish and supply labor and equipment to mow the seeded area(s) a minimum of one (1) time(s) per season.

3.02 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 Engineer 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 Engineer's direction at no additional cost to The Jefferson Project.

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 Engineer'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 Engineer 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

1.01 SCOPE OF WORK

A. This Section includes aggregate base courses complete with aggregate materials constructed in preparation for paving or aggregate surfacing.

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 23 13 - Subgrade Preparation

D. Section 32 12 16 - Bituminous Paving

1.03 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

1.04 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.

1.05 TEST REPORTS

A. The testing lab must provide the Engineer 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 Engineer.

1.06 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 Engineer.

1.07 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

2.01 DENSE-GRADED AGGREGATE

A. Dense-graded aggregate gradation to conform to Class 21 and 22, as specified in MDOT Section 902.05.

2.02 CALCIUM CHLORIDE ADDITIVES

A. Calcium chloride additives to conform to ASTM D98 and as specified in MDOT Section 922.12.

2.03 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

3.01 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.

3.02 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 Engineer may require the installation of edge drain.

3.03 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 Engineer, prior to any changes.

3.04 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.

3.05 INSTALLATION - GENERAL

A. Indicate width, thickness, and type of aggregate materials on the Plans or as directed by the Engineer.

B. Do not place aggregate material until the Engineer approves the subgrade, subbase, or existing aggregate surface.

3.06 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 Engineer'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 Engineer, 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 Engineer, at the Contractor's expense.

I. With the approval of the Engineer, 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.

3.07 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.

3.08 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 Engineer.

3.09 TESTING

A. Engineer 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 The Jefferson Project and approved by the Engineer. 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 Engineer.

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 Engineer.

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 Engineer determines otherwise. Correct sections deficient in depth using methods approved by the Engineer.

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 12 16 - BITUMINOUS PAVING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes bituminous paving complete with bituminous materials; bituminous mixtures; installation of bituminous base course, bituminous wearing course, and bituminous curbs; construction of bituminous pavement, sidewalks, drive approaches, and tennis courts; cold milling; and pulverizing existing pavements.

1.02 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 11 00 - Clearing and Grubbing

E. Section 31 23 13 - Subgrade Preparation

F. Section 32 11 23 - Aggregate Base Courses

G. Section 32 17 23 - Pavement Markings

H. Section 32 92 19 - Seeding

I. Section 32 92 23 - Sodding

1.03 REFERENCE STANDARDS

A. Unless otherwise specified, the Work for this Section must conform to the applicable portions of the following Standard Specifications:

1. AASHTO M 17 - Standard Specification for Mineral Filler for Bituminous Paving Mixtures
2. AASHTO M 29 - Standard Specification for Fine Aggregate for Asphalt Mixtures
3. AASHTO M 81 - Standard Test Methods and Practices for Emulsified Asphalts
4. AASHTO M 82 - Standard Specification for Cutback Asphalt (Medium-Curing Type)
5. AASHTO T 180 - Standard Method of Test for Moisture–Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
6. ASTM D244 - Standard Test Methods and Practices for Emulsified Asphalts
7. ASTM D692/D692M - Standard Specification for Coarse Aggregate for Asphalt Paving Mixtures
8. ASTM D1073 - Standard Specification for Fine Aggregate for Asphalt Paving Mixtures
9. ASTM D2026 - Standard Specification for Cutback Asphalt (Slow-Curing Type)
10. ASTM D2027/D2027M - Standard Specification for Cutback Asphalt (Medium-Curing Type)
11. ASTM D2028 - Standard Specification for Cutback Asphalt (Rapid-Curing Type)

12. American Association of State Highway and Transportation Officials
13. Michigan Department of Transportation (MDOT), Standard Specifications for Construction, latest edition
14. Michigan Asphalt Paving Association

1.04 ALLOWABLE TOLERANCES

A. Following the final rolling, the surface will be tested longitudinally using a 10 foot straight edge at locations selected by the Engineer. The variation of the surface from the testing edge of the straightedge between any two contacts with the surface will at no point exceed the following limits:

1. For Bituminous Base Course Mixtures:
    a. Multiple Courses:
        1) 3/8 inch for top course
        2) 3/4 inch for lower courses
2. For Bituminous Surface Course Mixtures:
    a. Multiple Courses:
        1) 1/8 inch for top course
        2) 1/4 inch for lower courses
    b. Single Course:
        1) 1/4 inch
3. Variations in excess of the specified tolerance must be corrected as determined by the Engineer.

1.05 MATERIAL REPORTS

A. At the request of the Engineer, the Contractor must provide the Engineer with certification that the various materials to be used conform to the Standards referred to in the Specifications.

B. Contractor must provide the Engineer with the load tickets prior to the placing of the materials.

C. Contractor must supply the Engineer with a certified Job Mix Formula for each type of bituminous mixture proposed for use on this Project.

1.06 TEST REPORTS

A. The testing lab will provide the Engineer with two (2) certified copies of the test results of the mix design and the thickness of the bituminous paving material.

B. The core drilling, testing for mix design and thickness, and the certification of the test results will be performed by a testing laboratory approved by the Engineer.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Comply with the requirements for bituminous concrete installation due to outside ambient air temperatures specified under this Section.

PART 2 PRODUCTS

2.01 BLENDED AGGREGATE

A. Blended aggregate must conform to:

1. AASHTO M29
2. ASTM D692/D692M
3. ASTM D1073
4. MDOT Sections 501 and 902

2.02 MINERAL FILLER

A. The mineral filler gradation must conform to:

1. AASHTO M17
2. Mineral filler, 3MF, as specified in _____

2.03 ANTI-FOAMING AGENTS

A. The anti-foaming agents must conform to anti-foaming agents, as specified in:

1. MDOT Section 904.

2.04 ASPHALT BINDER

A. Asphalt binder for use in production of bituminous mixtures must be performance graded asphalt binder:

1. PG58-28 per MDOT Section 904 unless otherwise indicated on the Plans.

2.05 LIQUID ASPHALTS

A. Liquid asphalts for use in pavement construction must conform to:

1. ASTM D2026
2. ASTM D2027/D2027M
3. ASTM D2028
4. AASHTO M81
5. AASHTO M82
6. MDOT Section 904

2.06 EMULSIFIED ASPHALT (BOND COAT)

A. Emulsified asphalt for use in pavement construction must conform to:

1. ASTM D244

2. MDOT Section 904

2.07 COMPOSITION OF MIXTURES

A. Bituminous mixtures must be mixed and placed in accordance with applicable requirements specified in MDOT Section 501 except as otherwise specified in this Section.

B. The blended aggregate used for the bituminous wearing course on this Project must have an Aggregate Wear Index (AWI) of 260, or higher.

C. The aggregates, mineral filler (if required), and asphalt binder must be combined as necessary to produce a mixture of the type as specified on the Plans.

1. Superpave Hot Mix Asphalt Mixtures must be in accordance with MDOT Section 501.

2. Marshall Hot Mix Asphalt Mixtures must be in accordance with MDOT Section Special Provision 20SP-501X-01 (latest edition).

D. The bituminous mixture specified on the Plans or in the Proposal, when tested at optimum asphalt content (determined in accordance with MDOT "Procedures for Mix Design Processing"), must meet the requirements for stability, flow, voids in mineral aggregate (VMA), air voids, fines/binder ratio, fine aggregate angularity, L.A. Abrasion loss, and soft particles as specified for the type of mix.

E. Mixtures failing to meet the requirements specified will be rejected and the Contractor will be required to submit additional samples of bituminous mixtures until a combination of material is found which will produce a mixture meeting the requirements.

F. If there is a change in the source of any of the aggregates, a new job-mix formula will be required.

G. After the job-mix formula is established, the aggregate gradation and the asphalt binder content of the bituminous mixture furnished for the Work must be maintained within the Range 1 uniformity tolerance limits permitted for the job-mix formula as specified in "Uniformity Tolerance Limits" table below.

1. If two (2) consecutive aggregate gradations on one (1), or asphalt binder contents as determined by the field extractions are outside the Range 1 but within the Range 2 uniformity tolerance limits, the Contractor will suspend all operations. Work days will be charged during the down time.

2. Before resuming any production, the Contractor will make necessary alterations to the materials or plant so that the Job Mix Formula can be maintained within the deviations permitted per Table 1.

Table 1 - Uniformity Intolerance Limits

Type of Course	Range (a)	(b)	Percentage Passing Designated Sieves			Asphalt Binder Content
			No. 8	No. 30	No. 200	
Top and Leveling	Range 1	± 5.0	± 5.0	± 4.0	± 1.0	± 0.40
	Range 2	± 8.0	± 8.0	± 6.0	± 2.0	± 0.50
Base Courses	Range 1	± 7.0	± 7.0	± 6.0	± 2.0	± 0.40
	Range 2	± 9.0	± 9.0	± 9.0	± 3.0	± 0.50

Table 1 - Uniformity Intolerance Limits
(a) This range allows for normal mixture and testing variations. The mixture will be proportioned to test as loosely as possible to the Job Mix Formula
(b) This includes all sieve sizes No. 4 and larger listed on the Job Mix Formula

H. Mixtures exceeding the maximum tolerances listed in the table, or exceeding the maximum limits specified for the master gradation range will be rejected and the Contractor may be required to remove and replace any bituminous pavements which the Engineer determines were constructed with mixtures in the excess of these tolerances.

I. Contractor will provide uniformity in the gradations of the aggregates placed in the cold feed bins so that the combination of aggregates produced for the mixture by blending the aggregates from two (2) or more cold feed bins will be uniformly fed by means of adjustable feeders onto a belt supplying the asphalt plant.

1. Feeders will be equipped with cutoffs which will automatically stop the operations to the asphalt plant at any time the flow of any aggregate fraction is changed so as to affect the uniformity of the finished product.

J. Contractor has the option of using hot bins for proportioning the aggregates to meet the specified tolerances.

K. Aggregate gradation tests will be made on aggregate extracted from samples of bituminous mixture taken from the trucks as directed by the Engineer.

1. As a general guideline, samples will be taken at initial start of production and at other times when tests indicate that the aggregate gradation is fluctuating, truck samples will be taken at a frequency of one sample per 250 Tons of mixture, but not more than four samples per day.

2. During other periods where tests indicate the aggregate gradation is stable, truck samples will be taken at a frequency of one sample per 500 Tons of mixture, but no more than two samples per day.

L. Exact mixture proportions will be based on composite samples of aggregate and the particular bituminous material called for on the Plans.

PART 3 EXECUTION

3.01 EXCAVATION

A. Prior to the installation of bituminous concrete pavement, Contractor will examine the excavation for the grades, lines, and levels required to receive the new Work. Ascertain that excavation and compacted subgrades are adequate to receive the bituminous pavement to be installed. Correct defects and deficiencies before proceeding with the Work.

3.02 SUBGRADE AND BASE COURSE CONDITIONS

A. Prior to the installation of any bituminous pavement, Contractor will examine the subgrade and base course to ascertain that it is adequate to receive the bituminous concrete pavement to be installed. If the subgrade remains wet after surface water has been removed, the Engineer may require the installation of edge drain.

3.03 EXISTING IMPROVEMENTS

A. Contractor will investigate and verify location of existing improvements, including structures, to which the new Work is to be connected. Adjustments in line and grade to align the new Work with the existing improvements must be approved by the Engineer, prior to any changes.

3.04 EQUIPMENT REQUIREMENTS

A. General:

1. Contractor will furnish sufficient equipment for completing the Work in a timely and efficient manner.

2. Equipment will be on the job site and ready for normal operation before the placing of material is started.

3. Equipment will be in good working order. Equipment will be subject to inspections and testing during construction.

4. Equipment will be of sufficient capacity that the operation can be continuous, and a rate of production obtained which ensures good workmanship and eliminates overloading of the equipment or frequent interruptions or delays.

5. Equipment will conform to the requirements as specified in MDOT Section 501 and as specified herein.

B. Pavers:

1. Paver will be an approved self-powered machine capable of spreading and finishing the mixture in a uniform layer at the desired thickness and cross section and ready for compaction. The use of any machine in poor mechanical or worn condition, will not be permitted. Paver will be of such design that the supporting wheels, treads, or other devices ride on the prepared base. The full width of surface being applied will be screeded by an oscillating or vibrating screed.

2. Paver will at all times produce a uniformly finished surface, free from tearing or other blemishes that would require hand work. The screed will be adjustable to provide for tilting to secure the proper dray or compressive action necessary to produce the desired surface texture.

3. Paver will be equipped with a hopper and an automatic material-depth control device so that each distributing auger and corresponding feeder will respond automatically to provide for a constant level of mix ahead of the screed unit to the full width of the lane being paved.

4. To ensure that adequate material will be fed to the center portion of the lane being paved, reverse pitch augers or paddles will be installed at the inside of one or both ends of the auger shafts to force the mix to the middle portion of the lane. If necessary to prevent segregation of the mix as it drops off the feed conveyor, baffle plates will be installed at the required location.

5. When extensions are added to the paver, they will be provided with the same vibrating screed or tamper action as the main unit of the paver, except for paving variable width areas. The extensions will also be equipped with a continuation of the automatically controlled spreading augers. The screed and any extensions will be provided with an approved method of heat distribution.

6. Unless specified otherwise, bituminous pavers will be equipped with an automatically controlled and activated screed and strike-off assembly capable of grade reference and transverse slope control.

    a. A manufacturer approved grade referencing attachment, not less than 30 feet in length, will be used for all lower courses and the first lane of the wearing course.

    b. After the first lane of the wearing course has been placed, a 10 feet or longer grade referencing attachment may be substituted for constructing subsequent adjacent lanes of wearing course mixture.

7. A self-propelled mechanical spreader capable of maintaining the proper width, depth, and slope without causing segregation of the material, may be used for base courses and for surface courses less than 8 feet in width.

8. When surfacing ramps or shoulders, or when the grade of a concrete gutter or other existing installation must be met, the manner of use of the automatic grade reference and slope control devices will be as approved by the Engineer.

9. Whenever a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually for the remainder of the normal working day, provided this method of operation will produce results meeting the specification requirements.

C. Crushing Equipment:

1. Crushing equipment for pulverizing existing bituminous base course will be an approved rotary reduction machine having positive depth control adjustments in increments of 1/2 inch and capable of reducing material which is at least 6 inches in thickness.

2. The machine will be of a type designed by the manufacturer specifically for reduction in size of pavement material, in place, and be capable of reducing the pavement material to the specified size. The cutting drums will be enclosed and will have a sprinkling system around the reduction chamber for pollution control.

3. The rate of forward speed must be positively controlled to ensure consistent size of reduced material. The machine must be equipped with an accurate tachometer which is mounted in full view of the operator.

4. Crushing equipment must meet the approval of the Engineer.

D. Cold Milling Machine:

1. Cold milling machine for removing concrete or bituminous surfaces will be equipped with automatically controlled and activated cutting drums that are capable of grade reference, transverse slope control, and produce a uniformly textured surface. An approved grade referencing attachment, not less than 30 feet in length will be used.

2. Equipment for removing the concrete or bituminous surface will be capable of accurately removing the surface, in one or more passes, to the required grade and cross section.

E. Joint Heaters:

1. Joint heaters will be infrared or other approved heaters, equipped with an automatic ignition and extinguishing system to ensure that the heater operates only when the paver is

moving. It must be of sufficient length and heating capacity to adequately soften the edge of the mat. The heater will be oriented parallel to the joint edge.

2. Bituminous pavement will not be heated by a direct open flame.

F. Rollers:

1. Steel-wheel rollers will weigh at least 8 tons and must be self-propelled, vibratory or static, tandem rollers or must be self-propelled static 3-wheel rollers.

   a. Steel-wheel rollers will be free from backlash, faulty steering mechanism, or worn king bolts. The steering device will respond readily and permit the roller to be directed on the alignment desired.

   b. Rollers will be equipped with wheel sprinklers and scrapers.

   c. Roller wheels will be smooth and free from openings or projections which will mark the surface of the pavement.

2. Vibratory rollers will have a shutoff to deactivate the vibrators when the roller speed is less than 0.5 mph and will have provisions to lock in the manufacturer's recommended speed, vibrations per minute, and amplitude of vibration (dynamic force) for the type of bituminous mixture being compacted.

3. The pneumatic-tired roller will be of the self-propelled type with a total weight, including ballast, not greater than 30 tons.

   a. It must be equipped with a minimum of seven (7) wheels situated on the axles in such a way that the rear group of tires will not follow in the tracks of the forward group, but will be so spaced that a minimum tire path overlap of 1/2 inch is obtained.

   b. The tires must be smooth and must be capable of being inflated to or adapted to achieve a pressure necessary to provide ground-contact pressures of at least 80 psi.

   c. The tire pressures must not vary by more than 5 psi between individual tires. Contractor must furnish a tire gage which will be available to enable the Engineer to check the tire pressures.

   d. Contractor must furnish the Engineer charts or tabulations showing the contact areas and the contact pressures for the full range of tire inflation pressures and tire loadings for the type and size roller used.

4. Roller must be equipped with a mechanism capable of reversing the motion of the roller smoothly.

5. Roller must be equipped with wheel sprinklers and scrapers or mats.

6. Rollers must be of sufficient size to compact the bituminous mixture to the required density without tearing, displacing, or cracking the mat.

G. Chip Spreader:

1. Chip spreader must be self-propelled and must be equipped with pneumatic tires.

2. Spreader will be equipped with a screen mounted below the metering gage.

3. Spreader must be capable of spreading the cover material uniformly at widths of 3 to 12 feet, or separate spreaders will be provided for the specific widths required.

4. Rate of discharge of the spreader will be adjustable to spread uniform layers of 10 to 50 pounds per square yard.

H. Bituminous Concrete Curbing Machine:

1. Bituminous concrete curbing machine must be self-propelled and must be capable of laying and satisfactorily compacting curved and straight line curb to the cross section specified on the Plans. It must be equipped with templates for the cross sections required.

3.05 PREPARATION OF FOUNDATIONS

A. For bituminous base course mixtures required to be placed directly on the subgrade, the density, grade and cross section must meet the approval of the Engineer at the time of placement of any mixture.

B. Prior to placing any bituminous mixture, the surface of any existing pavement, including joints and cracks, must be thoroughly cleaned of all dirt and debris.

C. Existing structures within the limits of the new Work must be adjusted as specified in the Plans, or as determined by the Engineer.

3.06 PREPARATION OF AGGREGATE BASE

A. Prior to the placing of prime coats or bituminous mixtures, density, grade and cross section of the aggregate base must meet the approval of the Engineer.

B. Surfaces that have become too wet or too dry must be reworked to provide the required density.

3.07 PREPARATION OF EXISTING PAVEMENT

A. This Work consists of preparation of the existing concrete road for resurfacing. Broken pavement or pavement not bonded to the base pavement, and loose bituminous surfacing or patches must be removed.

B. Longitudinal and transverse joints and cracks will be cleaned in accordance with Article 3.14 - Joint Cleaning of this Section.

C. Butt joints at the end of surfacing sections and at intersections of adjoining streets must be made in accordance with Article 3.08 - Butt Joints of this Section. The vertical face of the cut will be maintained true, straight and undamaged until installation of wearing course.

3.08 BUTT JOINTS

A. If butt joints are specified on the Plans, or by the Engineer, the old surface will be cut back for at least 5 feet to a depth of at least 1 inch for the full width of the joint. The vertical face of the cut will be maintained true, straight and undamaged until installation of wearing course.

3.09 EDGE TRIMMING

A. Trimming and truing the edge of an existing bituminous surface will be performed as required to give a straight, sharp edge at the proper elevations.

B. The existing base under the bituminous surface will be left undisturbed.

3.10 REMOVING BITUMINOUS SURFACING

A. When removing existing bituminous surface course, the edges of the area to be removed will be cut along straight lines, either perpendicular to or parallel to the direction of travel, for the full depth of the full depth of the surface course; with the cut edge a minimum of 18 inches back from the disturbed edge of pavement.

B. The cutting of the edges and the breaking up of the bituminous material within the removal area; and the removing and disposing of the unsuitable material are included in the Work of removing bituminous surfacing.

3.11 REMOVING BITUMINOUS PATCHES

A. Where the removal of bituminous patching material is specified on the Plans or as determined by the Engineer, it will be saw cut along the edges of the patched area to prevent the tearing of adjoining pavement surfaces during the removal operation.

B. The cutting, removing and disposing of bituminous surfacing and unsuitable materials are included in the Work of removing bituminous patches.

3.12 PULVERIZATION AND SHAPING OF EXISTING BITUMINOUS BASE COURSE

A. This Work consists of scarifying, pulverizing, milling, crushing, adding new material if required, shaping, rolling, compacting, and proof rolling the crushed base to the proper elevation and slope.

B. Additional materials required to fill holes and voids will be furnished at the Contractor’s expense. Additional aggregate, if required, will be MDOT 21A.

C. The material will be scarified and uniformly pulverized to a maximum size of 2 inches, in addition, 95-100 percent of the material must have a particle size of 1-1/2 inches or smaller.

D. The material will be scarified and uniformly pulverized, in one or more passes, to the depth specified on the Plans or as determined by the Engineer.

E. The maximum length or width of roadbed to be scarified and pulverized at any one time will be as specified on the Plans or as determined by the Engineer.

F. The crushed material will be rough graded to within 3/4 inch of the final grade as called for on the Plans or as determined by the Engineer. Additional aggregate will be placed, if necessary, to attain the required cross sections.

G. After the material has been balanced, it will be thoroughly mixed. In restrictive areas, the material to be mixed may be bladed into a windrow to provide working room for the mixer.

H. The mixed material will be shaped and compacted in reasonably close conformity with the lines, grades, and cross sections shown on the Plans or as established by the Engineer. Excess material will be removed and disposed of by the Contractor at Contractor's expense.

I. Finished rolling will be done with a vibratory steel wheel roller.

J. Aggregate-bituminous pavement mixture will be compacted to not less than 95 percent of the unit weight obtained by the AASHTO T 180 test method. The test will be made on the

aggregate-bituminous mixture at the field moisture content existing during the compacting operation. Required density will be maintained until the material has been surfaced.

K. Prior to the placing of any surface courses, the pulverized material must be proof rolled. Proof rolling will be accomplished with an 18,000 lbs single axle load.

L. Unstable areas must be removed and backfilled.

3.13 HAND PATCHING

A. Where the filling of holes and depressions in the base or the replacing of the patches is specified on the Plans or as determined by the Engineer, the filler material must be an approved bituminous mixture. The mixture selected will be dependent on the depth and size of the patch and the type of mixture and performance grade of the asphalt binder required.

B. Patches will be compacted to the required grade by use of a machine vibrator or approved roller.

3.14 JOINT CLEANOUT

A. Where joint cleanout is specified on the Plans or as determined by the Engineer, the joint sealants and foreign material will be removed to a minimum depth of 1 inch by approved mechanical or hand methods.

B. Removal and disposal of unsuitable materials and the removal and disposal of bituminous surface patches adjacent to joints are included in the Work for joint cleanout.

3.15 REPAIRING PAVEMENT JOINTS

A. Where existing pavement joints and cracks are to be repaired, as specified on the Plans or as determined by the Engineer, the existing bituminous surface and any loose or spalled concrete around the joints and cracks will be removed.

B. Each joint or crack will be cleaned and will be filled with an approved mixture and the mixture will be compacted with a vibratory machine or by an approved method.

3.16 COLD MILLING CONCRETE OR BITUMINOUS PAVEMENT

A. Where cold milling concrete or bituminous pavement is specified, the pavement will be milled to the shape and cross section as shown on the Plans. Immediately after cold milling, the surface must be cleaned.

B. Contractor will remove and dispose of resulting debris.

C. When allowed by the Engineer, milling materials may be used for temporary wedging.

1. Prior to placing pavement, temporary wedging materials must be removed and disposed of. Wedging with milled materials is incidental to the Project.

3.17 GENERAL BITUMINOUS PAVEMENT INSTALLATION REQUIREMENTS

A. The width, thickness and type of bituminous paving improvement will be specified on the Plans, indicated in the Proposal or as determined by the Engineer.

B. At street intersections, curb drops conforming to the current rules and regulations of Act 8, Michigan PA 1973, as amended, must be provided for the construction of sidewalk ramps. In

addition, curb drops for sidewalks and driveway approaches must be provided in locations called for on the Plans or as determined by the Engineer.

C. Existing improvements, including structures, will be protected to prevent their surfaces from being discolored during application of bituminous materials.

3.18 BITUMINOUS PRIME COAT OR BOND COAT

A. The prepared foundation will be treated with bituminous material for prime coat or bond coat as specified. A bond coat will be applied to each layer of bituminous mixture before the succeeding layer is placed.

B. The bituminous material will be applied uniformly by means of a pressure distributor. In areas inaccessible to the regular distributor operation, the bituminous material will be applied by means of the hand spraying apparatus of the distributor.

1. Where necessary to accommodate traffic, the surface will be treated half-width or as recommended by the Engineer.

2. The foundation will be free from moisture when the treatment is applied.

3. Under no circumstances will pools of bituminous material be allowed to remain on the surface.

C. The amount of prime coat to be applied per square yard will be 0.05 gallons per square yard unless otherwise specified on the Plans or directed by the Engineer.

D. When prime coat is applied, the surface course will not be placed until the prime coat has properly cured. No blotting of the prime coat with aggregate in lieu of proper curing will be permitted.

E. The prime coat may be omitted or reduced when authorized by the Engineer.

F. The bond coat will be applied at the rate specified or as directed by the Engineer. This rate will be between 0 to 0.10 gallons per square yard on a bituminous or concrete foundation and between 0-0.05 gallons per square yard between subsequent courses.

G. The bond coat material will be applied ahead of the paving operation for a distance of at least 1500 feet depending on traffic conditions or as determined by the Engineer. The surfacing will not be placed until the bond coat has cured.

3.19 TRANSPORTATION OF MIXTURES

A. The transportation of the mixtures as specified will be in accordance with MDOT Section 501.

3.20 PLACING BITUMINOUS MIXTURES

A. Pavers will be required to have an automatically controlled and activated screed and strike-off assembly except when placing mixtures for:

1. variable width sections

2. sections of pavement less than 1000 feet in length

3. placing the first course of a base course mixture on an earth grade or on a sand subbase

4. placing base course mixtures in widths less than 8 feet

B. Bituminous base course mixtures will not be placed in lifts exceeding unless otherwise approved by the Engineer. Approval to place lifts in excess of 3 inches will be based on the ability of the Contractor to place and compact the base course to the required cross section and within the specified tolerances.

C. For lifts of 2-1/2 inches or greater, a berm of shoulder material will be banked against the outside edge of each layer of mixture placed unless the sequence of operations is such that the edges of the material are adequately confined and supported in some other manner. The width of material placed will be twice the height of the bituminous layer being placed but in no case less than a 6 inch width.

D. When the application rate for a bituminous wearing course exceeds 220 pounds per square yard, the pavement will be constructed in two or more courses, unless otherwise specified on the Plans or as authorized by the Engineer.

E. The bituminous mixture will be placed by an approved self-propelled mechanical paver to such a depth that when compacted, it will have the thickness specified.

1. The mixture will be dumped into the center of the hopper and care must be exercised to avoid overloading the paver and spilling the mixture upon the base.

2. The paver speed will be adjusted at the discretion of the Engineer to that speed which, in his opinion, gives the best results for the type of paver being used and which coordinates satisfactorily with the rate of delivery of the mixture to the paver to provide a uniform rate of placing the mixture without intermittent operation of the paver.

F. When delays result in slowing paving operations such that the temperature of the mat immediately behind the screed falls below 170 degrees Fahrenheit, paving will be stopped and a transverse construction joint placed.

G. Bituminous mixture will be placed in one or more layers as called for on the Plans or as approved by the Engineer.

1. To take out irregularities in the existing road surface, wedging with bituminous mixture will be done by placing several layers with the paver.

2. Corrections to the foundation by wedging with bituminous material will be made by placing, compacting, and allowing the material to cool prior to paving.

H. Bituminous mixtures will be placed using two pavers in echelon or one paver equipped with an approved joint heater. Engineer may omit the use of the joint heater if the temperature of the previously placed mat does not fall below 170 degrees Fahrenheit prior to placement of the adjacent course.

1. Echelon paving will be permitted when allowed by the Engineer.

I. Cold joints will be permitted along acceleration and deceleration lanes, lanes less than full width, irregularly shaped sections, and at transverse joints. The edges of the initial mat for cold joints will be painted with bituminous material before the bituminous mixture is placed in the adjacent section.

J. In placing the bituminous mixture adjacent to joints, hand raking or brooming will be required to provide a dense smooth connection.

K. Connections with existing surfaces at the beginning and end of resurfacing sections, and at intersections will be made by feathering out the mix, by constructing a butt joint, or as approved by the Engineer.

L. Placing the bituminous mixture will be in accordance with MDOT Section 501.

M. If the lanes are being constructed with two or more pavers in echelon, the loss depths of bituminous material from each paver will match at the longitudinal joints.

3.21 ROLLING AND COMPACTING OF BITUMINOUS MIXTURES

A. Each layer of bituminous mixture will be compacted with approved rollers. At least two rollers will be required when the mixture lay-down rate exceeds 800 square yards per hour.

1. Steel 3-wheel rollers may be used for initial compaction immediately following the paver.

B. The final rolling operation on each layer of bituminous mixture will be accomplished by use of tandem steel-wheel rollers or by use of vibratory rollers operated in the static mode.

1. Roller wheels will be kept properly moistened with water.

C. Pneumatic-tired rollers will be operated in a competent manner and will not mark or rut the surface or displace the pavement edges. The pneumatic-tired roller must be ballasted to obtain the required ground-contact pressures as directed by the Engineer.

1. To obtain a uniformly textured mat and the desired pavement density, the Engineer may recommend the Contractor to raise or lower tire pressures at any time during the rolling operations.

2. Roller operations will be conducted in such a manner as to prevent scuffing or chatter marks in the pavement surface.

3. The number of passes made by the pneumatic-tired roller will not be less than two round trip passes over each area.

D. Rolling of the mixture will begin as soon after placing without undue displacement, picking up the mat, or cracking. Rolling will start longitudinally at the extreme sides of the lanes and proceed toward the center of the pavement, overlapping on successive trips by at least half the width of the drive wheel of the roller.

1. Alternate trips of the roller must be of slightly different lengths.

2. Maximum roller speed must not exceed the manufacturer's recommended speed for the type of mixture or thickness of layer being placed.

E. When compacting an adjoining lane, the longitudinal joint will be rolled first with the roller supported mainly on the cold lane with only 3 to 6 inches of the roller extending onto the freshly placed bituminous material.

F. Finish rolling will continue until all roller marks are eliminated.

G. Pneumatic-tired rollers will not be permitted on wearing courses.

H. Areas too narrow to be rolled directly by standard 8 ton tandem rollers will be compacted by self-propelled trench rollers of suitable width, approved by the Engineer, and weighting not less than 300 pounds per inch of width.

I. Skin patching on an area that has been rolled will not be permitted. Any mixture that becomes mixed with foreign material or is in any way defective must be removed and replaced at the Contractor's expense.

3.22 WEATHER AND SEASONAL LIMITATIONS

A. Bituminous mixtures will not be placed, nor the prime coat or bond coat applied when rain is threatening or when the moisture on the existing surface would prevent satisfactory bonding.

B. Unless otherwise approved by the Engineer in writing, seasonal limitations for placing bituminous mixtures must be in accordance with the following:

1. Seasonal Limitations:

a. May 5 to November 15

C. Unless otherwise approved by the Engineer in writing, minimum mixture temperature limitations at the time of placement for placing bituminous mixtures must be in accordance with Table 2.

Table 2 - Mix Temperature Limitations

Temperature of Surface being Overlayed	Rate of Application of Bituminous Material		
	<120 lbs per syd	120-200 lbs per syd	>200 lbs per syd
35 to 39 degrees F			330 degrees F
40 to 49 degrees F		330 degrees F	315 degrees F
50 to 59 degrees F	330 degrees F	315 degrees F	300 degrees F
60 to 69 degrees F	315 degrees F	300 degrees F	285 degrees F
70 to 79 degrees F	300 degrees F	285 degrees F	270 degrees F
80 to 89 degrees F	285 degrees F	270 degrees F	270 degrees F
90 degrees F and over	270 degrees F	270 degrees F	270 degrees F
Bituminous paving will not be allowed when the mix temperature is below these minimum temperatures, nor when there is frost on the grade or existing surface.			

3.23 HEATING BITUMINOUS MATERIALS

A. Bituminous material which requires heating before application will be heated in such a manner as to ensure a uniform temperature throughout the entire mass with efficient and positive control at all times. It will be heated to a temperature consistent with the type of material used and only to such temperature as will ensure the necessary fluidity.

1. Excessively high temperatures must be avoided.

2. A thermometer must be provided to enable the Engineer to observe the temperature at any time.

3. Any bituminous material which has been overheated will be rejected and replaced at Contractor's expense.

B. Asphalt emulsion will be circulated continuously when heated above atmospheric temperature so as to prevent it from separating.

1. Heating of asphalt emulsion to the required temperature for application must be done entirely in the distributor unless a uniform temperature is maintained in the storage tank by means of a circulating heater.

2. Any asphalt emulsion which has been damaged by continuous heating for too long a time or by alternate heating and cooling will be rejected and replaced at Contractor's expense.

3.24 PATCHING

A. Where patching is required on a bituminous surface or concrete surface because of small holes or pitted surface, the holes will be cleaned of dirt and foreign material.

B. Bituminous patching material will be placed, struck off and compacted so that when completed, the patch will be flush with the adjacent pavement. Compaction may be done with a hand tamper, vibratory compactor or roller as approved by Engineer.

C. When patching is required for repairing a cut in the pavement, made for the construction of underground structures and utilities, the granular backfill will be compacted to not less than 95 percent of the maximum unit weight. An aggregate base material of not less than 12 inches compacted thickness, or a bituminous base of the specified thickness on the Plans, will be used. The top of the base will be 2 to 2-1/2 inches below the surface of the adjacent pavement. Bituminous patching material will be placed and compacted.

D. The surface of the bituminous patch will be smooth and not vary more than 1/4 inch from the crown and grade of the adjacent pavement. Variations over 1/4 inch from the established grade must be corrected by the Contractor, as determined by the Engineer.

3.25 CHIP SEAL

A. Seal coating will consist of one or more applications of bituminous material applied to the prepared surface and one or more coverings of coarse or fine aggregate applied to the bituminous material.

B. Asphalt emulsion must be CSEA or CRS-2M and aggregate will be MDOT 29A unless otherwise specified on the Plans.

C. Cover materials used for seal coating will be sufficiently dry when it comes in contact with bituminous material. Moisture content must not exceed three percent by weight on a dry basis. Satisfactory means will be provided by the Contractor for protection of the coating materials against excessive moisture by covering stockpiles, aeration or through approved manipulation.

D. Bituminous material specified for surface coat will be uniformly applied by means of the pressure distributor in the number of applications provided and in the amount per square yard as determined by the Engineer. Each application of bituminous material must cure sufficiently to prevent displacement or pickup by traffic or construction equipment before a succeeding application of bituminous material is made.

E. Following the application of surface coat bituminous material, the cover material must be uniformly spread over the surface by means of approved mechanical spreaders, in the amount per square yard specified or as determined by the Engineer. Truck wheels will ride on spread cover material and not on bituminous material.

F. Irregularities or deficiencies in the uniformity of the cover aggregate on the surface must be corrected by hand spreading and dragging.

G. Following the spreading of each course of cover material, the surface will be rolled by means of approved rollers.

H. Rolling will immediately follow the placing of cover material before the bituminous material has set. At no time will there be more than 300 feet of unrolled cover material. No cover material will be left unrolled for more than 5 minutes.

I. Sufficient rolling will be done to embed the cover material in the bituminous material without crushing the aggregate.

J. For areas deficient in cover material after completion of the surface treatment, additional cover material must be added. For areas with excessive cover material, the excess cover material must be removed before the next seal is applied. The final application of cover material will be swept with a power broom.

K. The completed surface will be maintained with a drag, broom or other approved equipment to keep the material well distributed on the road until all cover material possible has been embedded in the bituminous material. The length of time required for this maintenance will be from 2-5 days, as determined by the Engineer, depending on weather and materials used.

3.26 HOT MIX ASPHALT (HMA) CURB

A. HMA curb will be constructed to the design specified on the Plans or as approved by the Engineer and will include the conditioning and treating of the surface on which the curb is to be placed.

B. Materials used in the construction and installation of bituminous concrete curbing will meet the requirements as specified in this Section, as well as those specified in MDOT Section 904.

C. HMA curb mixture will be the same HMA mixture required to construct the leveling and top courses of pavement, unless otherwise approved by the Engineer.

D. HMA curb must be constructed to conform to the Plans or as determined by the Engineer. The method of construction must conform to MDOT Section 805, unless otherwise specified.

E. HMA must be thoroughly compacted by a curbing machine to the cross section shown on the Plans, or as determined by the Engineer. Curb will be formed to the density to produce a tight surface texture. Curbs showing segregation, slumping, or misalignment must be removed and replaced at the Contractor's expense.

F. When specified on the Plans or as directed by the Engineer, an application of asphalt emulsion or other approved bituminous coating will be applied to the finished curb at the joint of the curb and pavement, or to the inside face of the curb, or to both, as a protective seal.

G. Backfilling behind the curb will not commence until the HMA has cured.

H. Backfill material must be placed and thoroughly tamped and compacted to the satisfaction of the Engineer, without disturbing the curb, and will be left in a neat and smooth finished appearance.

3.27 BITUMINOUS APPROACHES, SIDEWALKS, AND SHOULDERS

A. This Work will consist of constructing a bituminous surface course as specified on the Plans, or as approved by the Engineer. The bituminous surface course will be placed on a prepared foundation.

B. Bituminous materials used will be as specified on the Plans, or as approved by the Engineer. Materials acceptable for use are specified in this Section and MDOT Section 904.

C. Bituminous approach mixture must be in accordance with MDOT Section 501, unless otherwise approved by the Engineer.

D. Existing pavement or aggregate base will be prepared to receive the bituminous surface course as specified in this Section.

E. Bituminous prime and bond coats used must meet the requirements specified in this Section. Care must be taken to prevent spreading of bituminous material on adjoining surfaces. When approved by the Engineer, the prime coat may be omitted.

F. Bituminous mixture will be placed to the thickness specified on the Plans or as determined by the Engineer.

G. Placing the bituminous mixture must conform to this Section.

H. When approved by the Engineer, the paver used for placing bituminous approaches and sidewalks will not be required to have an automatically controlled or activated screed or strike-off assembly or the corresponding grade referencing equipment. Also, with approval from the Engineer, only one roller may be used with each paver.

3.28 TENNIS COURTS

A. Bituminous tennis courts will be constructed to the cross section shown on the Plans, or as determined by the Engineer.

B. The materials used in the construction of the bituminous tennis court must meet the requirements specified in this Section and MDOT Section 904.

C. Bituminous base course mixture will be Marshall Mix MDOT 4C or 13A as specified in MDOT Special Provision 20-SP501X-xx and in accordance with MDOT Section 501, unless otherwise specified on the plans.

D. Bituminous surface course mixture will be Marshall Mix MDOT 4C, 13A or 36A as specified in MDOT Special Provision 20-SP501G-xx and in accordance with MDOT Section 501, unless otherwise specified on the plans.

E. Asphalt content and performance grade will be determined by the job mix formula submitted by the Contractor and approved by the Engineer.

F. The bituminous base course and wearing course will be constructed to conform to the Plan. The method of construction must conform to MDOT Section 501, unless otherwise specified.

G. The bituminous bond coat used must meet the requirements specified in this Section.

H. The rate of application must be 0.05-0.10 gallons per square yard.

I. For the preparation of the foundation to receive the bituminous base course and bituminous surface course see Part 3 of this Section.

J. The bituminous base course, if required, and the bituminous surface course will be installed to thickness shown on the Plans. The method of installation of mixtures must conform to this Section.

3.29 CLEANUP

A. The area adjacent to the new Work will be backfilled with sound earth of topsoil quality.

B. The backfill will be compacted, leveled and left in a neat, smooth condition. At a seasonally correct time the disturbed area will be raked, have topsoil placed thereon, fertilized and seeded per the requirements of Section 32 92 19 - Seeding, or sodded in accordance with Section 32 92 23 - Sodding.

3.30 MONUMENT BOXES

A. All government, plat, and street intersection monuments within existing or proposed pavement must be preserved by enclosing in standard monument boxes. Monument box castings must be furnished and installed by the Contractor and will be East Jordan Iron Works No. 1570 or approved equal.

B. Existing monument boxes will be adjusted to meet the proposed pavement elevation by removing the castings and resetting to the required elevation. Support for the monument box will be concrete bedding, so constructed as to hold them firmly in place. The adjacent pavement, curb, or curb and gutter will be replaced to the new elevation, condition, and kind of construction, unless otherwise provided.

3.31 TESTING

A. During the course of the Work, the Engineer may require testing for mix designs, aggregate gradation and physical properties, bitumen content, compaction or density, and thickness of material. The testing and coring required must be performed by a testing laboratory approved by the Engineer.

1. The cost for testing and coring will be at the expense of the The Jefferson Project.

2. The testing laboratory will furnish the Engineer with two certified copies of the test results .

B. Testing procedures must conform to current MDOT Standards.

1. Testing of asphalt binders, liquid asphalts, asphalt emulsions, and tars must conform to MDOT Section 904.

C. Rolling will proceed until the required compaction is attained and the amount of rolling required will be based on the test results of a nuclear gage or on using a specified minimum number of rollers. When the total tonnage for the Project is in excess of 1,000 tons, the nuclear gage method will be used to govern the compaction requirements.

D. When the total tonnage for the Project is in excess of 1,000 tons, the nuclear gage method will be used to govern the compaction requirements.

1. The control density for the bituminous mixture to be placed, will be determined by use of a modified Marshall Test.

E. Control Density:

1. During the Contractor's start-up operations, a rolling procedure to attain the control density will be established.

    a. The rolling procedure will be based on the number and type of rollers used and the rolling pattern.

    b. The goal of the compaction effort will be to establish a rolling procedure which will achieve 100 percent of the control density but in any case, the density achieved must not be less than 95 percent of the control density.

    c. Density values less than 98 percent will be sufficient cause for the Engineer to require an adjustment in the number or type of rollers being used or in the rolling pattern.

2. Once the procedure has been established on the start-up section, the procedure will be used for the remainder of the mixture to be placed, unless subsequent tests indicate a need to change the number of rollers or the rolling pattern.

3. If difficulties are encountered or if there is a significant change in aggregate or bitumen content, the Engineer will determine the control density for the new mixture and require the Contractor to again establish the number and type of rollers and the rolling pattern required on the new mixture to attain the control density.

    a. Compaction procedures thus determined will be used when placing the remainder of that mixture.

4. Density checks will be made at the discretion of the Engineer to determine if the compaction procedure being used is achieving the required density, or if a change in procedure is necessary.

5. Each layer of bituminous mixture will be compacted to at least 95 percent of the control density, using the established procedure.

3.32 PRICE ADJUSTMENTS

A. Samples of asphalt binder may be taken prior to incorporation into the mixture and from the bituminous mixture. Where results of tests on these samples deviate from specification requirements, the affected material will be subject to price adjustments on the following basis:

    1. When the test results deviate from the limits specified in MDOT Table 904-1, "Performance Graded Asphalt Binder Specification", by ten percent or more, the mixture produced will be evaluated by the Engineer and if in the Engineer's judgment the defective pavement warrants removal, the Contractor must remove and replace the affected area at the Contractor's expense.

        a. If it is determined that the removal is not required, the Contract unit price of the affected mixture will be reduced by ten percent.

B. Core samples may be taken on the completed Work. If the results from testing of the core samples indicates a deficiency in the completed Work, the Engineer will evaluate the test results and will recommend removal and replacement or a credit to the The Jefferson Project.

END OF SECTION

SECTION 32 13 13 - CONCRETE PAVING

PART 1 GENERAL

1.01 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.

1.02 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

1.03 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

1.04 MATERIAL REPORTS

A. Provide certification to Engineer, 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 Engineer with the mix design, as required by ASTM C94/C94M, prior to the actual delivery of the ready-mixed concrete.

1.05 THICKNESS AND COMPRESSIVE STRENGTH REPORTS

A. Contractor to make sure the testing lab provides Engineer 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 Engineer.

1.06 WATER QUALITY TEST REPORTS

A. Contractorto make sure the testing lab provides Engineer 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 Engineer.

1.07 REQUEST FOR MATERIAL VARIANCE

A. Make all requests for variances in the materials, as specified, in writing to Engineer.

B. Submit two (2) copies of the request for the Engineer's review and approval.

1.08 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

2.01 CEMENT

A. Use low alkali, air-entraining Portland cement conforming to ASTM C150/C150M, Type IA or Type IIIA.

2.02 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.

2.03 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.

2.04 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 The Jefferson Project 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.

2.05 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.

2.06 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.

2.07 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.

2.08 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.

2.09 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 Engineer. 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 Engineer

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 Engineer with the mix design for review and approval prior to the actual delivery of the concrete.

PART 3 EXECUTION

3.01 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.

3.02 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 Engineer may require the installation of edge drain.

3.03 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 Engineer.

3.04 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.

3.05 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.

3.06 INSTALLATION - GENERAL

A. Construct the concrete pavement to the width, thickness, and type specified on the Plans or as approved by Engineer.

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 Engineer.

D. Restrict construction operations to the existing right-of-way. If additional area is needed, furnish Engineer 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 Engineer.

3.07 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 Engineer. 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.

3.08 EQUIPMENT REQUIREMENTS

A. Use approved mechanical concrete placing and finishing equipment for concrete paving, except in gapped areas or where Engineer 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 Engineer.

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 Engineer.

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 Engineer.

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 Engineer.

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.

3.09 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 Engineer.

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 Engineer.

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 Engineer, 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 Engineer.

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 Engineer. 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 Engineer.

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 Engineer.

3) Use bar chairs to support the lane tie bars or install the lane tie bars with a mechanical device approved by Engineer. 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 Engineer. 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 Engineer.

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 Engineer 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 Engineer 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 Engineer 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 Engineer.

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 Engineer.

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 Engineer 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 Engineer.

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 Engineer 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 Engineer.
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 Engineer.

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 Engineer 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, Engineer may, at his discretion, require that sufficient compound be taken from the melting unit to make flow tests.

G. Engineer 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 Engineer, 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 Engineer before placing concrete. Use other covering materials approved by Engineer 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 Engineer. Spread calcium chloride on the materials immediately before discharging them into the mixer drum. Use a method approved by the Engineer 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 Engineer.

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 Engineer.

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 Engineer. Do not place concrete when the

predicted high temperature falls below the specified limit without written permission from the Engineer. 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 Engineer 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 Engineer 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 Engineer.

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 Engineer, 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 Engineer.

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 Engineer, 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. Engineer 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, Engineer may require the taking of standard test cores and cylinders, by a testing laboratory acceptable to The Jefferson Project and approved by Engineer.

B. Charge The Jefferson Project 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 Engineer.
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

1.01 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.

1.02 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

1.03 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.

1.04 SUBMITTALS

A. Obtain written permission for the use of all local disposal sites and furnish copies to the Engineer.

B. Provide, at the request of the Engineer, certification that the various materials to be used conform to the ASTM Standards referred to in the Specification.

1.05 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 Engineer.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Comply with the requirements for concrete installation due to outside ambient air temperatures specified under Part 3 of this Section.

1.07 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

2.01 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 Engineer'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 Engineer.

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 Engineer.

    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.

2.02 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.

2.03 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.

2.04 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 Engineer.

2.05 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.

2.06 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

3.01 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.

3.02 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 Engineer prior to any change.

3.03 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.

3.04 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 Engineer.

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 Engineer.

3.05 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 Engineer 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 Engineer. Curbs that are cut or ground down that are not acceptable to the Engineer, will be removed and replaced at Contractor's expense.

3.06 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 Engineer in lieu of the construction system described above.

3.07 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 Engineer.

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 Engineer.

E. Unless otherwise specified on the Plans or unless otherwise determined by the Engineer, 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 Engineer.

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.

3.08 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.

3.09 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 Engineer, rake the disturbed area then place topsoil. Fertilize and seed per the requirements of Section 32 92 19

3.13 TESTING

A. Engineer 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 The Jefferson Project and at the expense of the Contractor.

2. Furnish two certified copies of the test results from the testing laboratory to the Engineer.

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

1.01 SCOPE

A. This section includes the requirements for constructing aggregate surfacing.

1.02 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

1.03 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

1.04 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.

1.05 TEST REPORTS

A. The testing lab must provide the Engineer 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 Engineer.

1.06 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 Engineer.

1.07 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

2.01 DENSE-GRADED AGGREGATE

A. Ensure the dense-graded aggregate gradation conforms to 22A or 23A as specified in MDOT Section 902.05.

2.02 CALCIUM CHLORIDE ADDITIVES

A. Ensure the calcium chloride additives conform to ASTM D98 and the specifications in MDOT, Section 903.04.

2.03 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

3.01 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.

3.02 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 Engineer may require the installation of edge drain.

3.03 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.

3.04 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 Engineer, prior to any changes.

3.05 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.

3.06 INSTALLATION - GENERAL

A. Indicate the width, thickness, and type of aggregate materials on the Plans or as determined by the Engineer.

B. Do not place any aggregate material until the subgrade, subbase, or existing aggregate surface has been approved by the Engineer.

3.07 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 Engineer.

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 Engineer, 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 Engineer, 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.

3.08 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 Engineer 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 Engineer 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 Engineer, 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 Engineer, 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.

3.09 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 Engineer.

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 Engineer, 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 Engineer 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 Engineer. Perform the testing and coring through a testing laboratory acceptable to the The Jefferson Project and approved by the Engineer.

1. Charge the cost for testing and coring to the The Jefferson Project.

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 Engineer. 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 Engineer.

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 Engineer. determines otherwise. Correct sections found deficient in depth using methods approved by the Engineer.

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 17 23 - PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes pavement markings complete with materials, layout of markings and preparation of pavement surfaces.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 33 00 - Submittal Procedures

1.03 REFERENCE STANDARDS

A. Conform the Work for this Section to the applicable portions of the following Standard Specifications, unless otherwise specified.

1. ASTM D4505: Standard Specification for Preformed Retroreflective Pavement Marking Tape for Extended Service Life
2. ASTM D4592: Standard Specification for Preformed Retroreflective Pavement Marking Tape for Limited Service Life
3. AASHTO M 247: Standard Specification for Glass Beads Used in Pavement Markings
4. AASHTO M 249: Standard Specification for White and Yellow Reflective Thermoplastic Striping Material (Solid Form)
5. AASHTO MP 24: Standard Specification for Waterborne White and Yellow Traffic Paints
6. FS TT-P-1952: Paint, Traffic And Airfield Marking, Waterborne
7. MDOT: Michigan Department of Transportation, Standard Specifications for Construction, latest edition

1.04 REQUIREMENTS OF REGULATORY AGENCIES

A. Conform pavement markings to the current requirements of the Michigan Manual of Uniform Traffic Control Devices (MMUTCD) issued under provisions of the Michigan Vehicle Code, Act 300, PA 1949, as amended, where applicable.

B. ADA pavement markings will comply with State and Federal guidelines.

1.05 SUBMITTAL OF MANUFACTURER'S LITERATURE

A. Submit manufacturer's literature for all paints to be used in the Work. Ensure the literature includes paint type, texture, color, temperature limitations, recommended use, spreading rate, drying time, and cleanup instructions.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver all materials to the Project site in original, unopened waterproof containers. Ensure packaging containers bear intact and legible manufacturing labels.

B. Ensure the label contains the following information: name and address of the manufacturer, shipping point, trademark or trade name, kind of paint, formula, amount in U.S. gallons, date of manufacture, lot number, type of paint, and AASHTO Specification Number.

C. Store all materials in waterproof containers, under protective covering, off the ground and away from extreme heat or cold until ready for use.

D. Handle materials in accordance with the manufacturer's recommendations.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Comply with the appropriate environmental limitations (air temperature, pavement temperature, and relative humidity) as outlined in MDOT Section 811.03.D.

PART 2 PRODUCTS

2.01 REGULAR DRY TRAFFIC MARKING PAINT

A. Ensure regular drying pavement marking paint in white and yellow colors complies with MDOT Section 920.

1. Select regular dry traffic paint from MDOT’s Qualified Products List.

2.02 WATERBORNE PAVEMENT MARKING PAINT

A. Ensure waterborne pavement marking material in white, yellow, and blue colors complies with FS TT-P-1952 (Type I, II, or III), AASHTO MP 24 and MDOT Section 920.

1. Select waterborne pavement marking paint from MDOT’s Qualified Products List.

2.03 THERMOPLASTIC PAVEMENT MARKINGS

A. Ensure hot-applied thermoplastic pavement markings in white and yellow colors conform to AASHTO M 249, white, yellow and blue thermoplastic striping materials (solid form), and MDOT Section 920.

1. Select hot-applied thermoplastic paving marking from MDOT’s Qualified Products List.

2.04 COLD PLASTIC PAVEMENT MARKINGS

A. Ensure preformed cold plastic pavement markings in white, yellow, and blue colors comply with ASTM D4505 and conform to MDOT Section 920.

1. Select cold-applied plastic pavement markings from MDOT’s Qualified Products List.

2.05 POLYUREA PAVEMENT MARKINGS

A. Ensure two-component, polyurea pavement marking material in white, yellow, and blue colors conforms to MDOT Section 920.

1. Select polyurea pavement marking material from MDOT’s Qualified Products List.

2.06 TEMPORARY PAVEMENT MARKING TAPE

A. Ensure temporary pavement markings comply with ASTM D4592, Type R and Type NR, and conform to MDOT Section 922.06.A.

1. Select temporary pavement markings from MDOT’s Qualified Products List.

2.07 GLASS BEADS

A. Ensure glass beads for reflectorizing white, yellow, and blue paint markings by the drop-in method on fresh paint stripes comply with AASHTO M 247 and conform to MDOT Section 920.02.

1. Select glass beads for use in pavement markings for the specified type of paint from MDOT's Qualified Products List.

PART 3 EXECUTION

3.01 VERIFICATION OF EXISTING CONDITIONS

A. Prior to the placing of any pavement markings, examine the limits of the new Work and ascertain that the existing surfaces are adequate to receive the material to be installed.

3.02 PREPARATION OF SURFACE

A. Surfaces to be painted must be thoroughly dry and free from dirt, loose paint, oil, grease, wax and other contaminants.

B. Include the costs incurred for removing and disposing of unsuitable materials in preparation of surfaces to receive the new Work as incidental to the price paid for the pavement markings.

3.03 PERFORMANCE - GENERAL

A. Limit the pavement marking operation to the type of Work and the limits specified on the Plans. If additional area is required for storage of equipment or supplies, provide the Engineer with written permission from the property owner of the storage area, permitting the storage.

B. Conduct operations and use equipment in such a manner that traffic is maintained throughout the Project, unless otherwise specified on the Plans or approved by the Engineer.

C. Maintain traffic for Work within public rights-of-way and other areas as determined by the Engineer, in accordance with the Michigan Manual of Uniform Traffic Control Devices (MMUTCD). Costs incurred in maintaining traffic will be at Contractor's expense.

D. Equip the Contractor's equipment with sufficient paint capacity to enable sustained pavement marking operations, ensuring uniform application of paint and thermoplastic pavement markings.

1. Equip the machinery with mechanical or pressurized bead dispensers. Ensure the equipment is sufficient to accomplish the marking operations safely, efficiently, and in a workmanlike manner.

2. For parking lots and other small areas, approved portable equipment and use of hand methods will be allowed.

E. Use the color of the paint, and the width or type of markings as specified on the Plans or as directed by the Engineer.

F. Apply markings so they adhere adequately to the surface.

G. Apply markings in accordance with the applicable requirements of MDOT Section 811 for permanent pavement markings or MDOT Section 812.03 for temporary pavement markings.

1. Remove temporary pavement markings as incidental to the Project, unless otherwise specified.

3.04 LAYOUT FOR MARKINGS

A. Layout work necessary for the location and placing of markings, as specified on the Plans or as determined by Engineer, will be the responsibility of Contractor and will be at his expense.

3.05 APPLICATION OF WATERBORNE MARKINGS

A. Apply waterborne paint when the air temperature is 50 degrees F or higher and the pavement is dry.

B. Contractor will be responsible for making the decision to apply waterborne paint on any specific day when there is a high probability of rain in the forecast.

1. Reapply lines at no additional expense to the The Jefferson Project if applied lines are washed away due to rain.

C. Waterborne pavement marking materials may be placed immediately on new bituminous pavement.

1. Do not place waterborne pavement marking material before May 1 or after October 1.

D. Apply waterborne paint with an application thickness of 15-mil and 8-mil dry thickness. Add glass beads at the rate of 32 lbs per mile per 4 inch line during the application process.

3.06 APPLICATION OF PRE-FORMED HOT-APPLIED THERMOPLASTIC MARKINGS

A. Since subsurface moisture can be present in amounts sufficient to affect proper bonding of the hot-applied thermoplastic material, Contractor will be responsible for insuring that the pavement is free of excess moisture that may effect proper bonding prior to beginning work.

B. Document the testing for moisture and provide the results to the Engineer.

C. Start marking operations when the minimum ambient air temperature is 48 degrees F and rising. If the air temperature falls below 45 degrees F and continued cooling is expected, stop all work. The minimum pavement temperature is 50 degrees F.

D. Heat and apply thermoplastic material within the temperature range recommended by the manufacturer.

1. Do not place thermoplastic material before May 14 or after October 1.

3.07 APPLICATION OF POLYUREA PAVEMENT MARKINGS

A. Do not apply polyurea pavement markings over existing non-polyurea pavement markings.

B. Completely remove existing non-polyurea pavement markings before applying polyurea pavement markings.

C. Remove curing compounds from concrete pavement.

D. Apply at a 15 to 25-mil thickness. Ensure the pavement is clean and dry. The pavement temperature must be 40 degrees F or higher, unless otherwise approved by the Engineer.

3.08 TOLERANCES

A. Place new and/or retraced markings in their proper locations, with reasonable tolerance.

B. Obliterate incorrect or misplaced markings and remark them according to the Engineer's instructions.

C. Costs incurred to obliterate and remark incorrect or misplaced markings will be at Contractor's expense.

3.09 PROTECTION OF MARKINGS

A. Protect wet paint and thermoplastic pavement markings, with the Contractor responsible for all related costs.

3.10 WEATHER AND TIME LIMITATIONS

A. Do not place markings when rain is threatening or when the surface to be painted is wet.

B. Perform pavement marking between May 1 and November 1, unless otherwise approved in writing by the Engineer.

C. Do not apply markings when the air temperature is less than 50 degrees F, as determined by the Engineer.

END OF SECTION

SECTION 32 31 00 - FENCES AND GATES

PART 1 GENERAL

1.01 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.

1.02 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

1.03 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

1.04 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.

1.05 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.

1.06 WARRANTY

A. General Warranty:

1. The Special Warranty specified in this Article does not deprive the The Jefferson Project 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 The Jefferson Project, agreeing to correct, or at option of the The Jefferson Project, 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

2.01 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.

2.02 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.

2.03 BRACING TRUSS

A. Diagonal truss: 3/8 inch nominal diameter rod with adjustable take-up.

2.04 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.

2.05 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.

2.06 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 Engineer, 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.

2.07 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.

2.08 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.

2.09 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 Engineer.

B. Cut posts from timber seasoned by stacking in a manner acceptable to the Engineer. 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 Engineer's approval.

PART 3 EXECUTION

3.01 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 Engineer. Do not commence Work until all unsatisfactory conditions have been corrected.

3.02 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.

3.03 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 Engineer. Make sure the finished fence is plumb, taut, true to line and ground contour, and rigidly secured in position.

3.04 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 Engineer. 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 Engineer in the locations shown on the Plans.

3.05 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 Engineer.

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 Engineer. Attach slats to the fabric with suitable metal fasteners on 6 inch vertical centers.

3.06 ADJUSTMENT

A. After erection of fences, adjust all gate hardware for smooth and positive operation.

3.07 POST LEVELING

A. Cut off the tops of wood posts to the proper elevation after erecting the fences.

3.08 LUBRICATION

A. After completion of fence erection, lubricate moving parts of gate hardware to ensure smooth operation without binding.

3.09 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

1.01 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.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 89 00 - Site Construction Performance Requirements

1.03 SOURCE QUALITY CONTROL

A. Ensure trees, shrubs, and ground cover comply with state and federal laws regarding inspection for plant diseases and insect infestation.

1.04 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

1.05 SUBMITTALS

A. Submit certificates of inspection for plant diseases and insect infestation to the Engineer.

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.

1.06 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 Engineer 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 Engineer will tag approved trees, and the tag must remain on the tree until planting and final inspection. Accompany the Engineer during the inspection.

1. Deliver the trees to the site. Tag approved trees with the Engineer’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 Engineer at the site prior to planting.

1.07 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.

1.08 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.

1.09 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 Engineer, 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 The Jefferson Project, in accordance with the plans and specifications.

C. Request final acceptance at the end of the Establishment Period. The Engineer and The Jefferson Project 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 Engineer'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 Engineer, 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

2.01 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 Engineer. Requests for substitutions and price adjustments due to substitutions must be submitted in accordance with the General Conditions.

2.02 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 Engineer. 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.

2.03 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 Engineer review source and final screen results prior to releasing topsoil. Submit a certified analysis of the topsoil from each source to the Engineer.

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.

2.04 SAND

A. Use clean, coarse, ungraded sand for planting mixture that conforms to ASTM C33/C33M for fine aggregates.

2.05 FERTILIZER

A. Use Agriform 21-Gram Planting Tablets Plus Minors or Engineer 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.

2.06 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.

2.07 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

2.08 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 The Jefferson Project.

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.

2.09 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 Engineer approved equal.

PART 3 EXECUTION

3.01 CONTRACTOR'S VERIFICATION

A. Stake all plant locations and confirm the locations and types of plants with the Engineer. 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.

3.02 PREPARATION

A. Do not begin excavation until the stakeout of tree and/or shrub locations is acceptable to the Engineer.

B. Stake enough planting locations for two weeks of work. Arrange periodic site meetings with the Engineer to review the work completed in the prior two weeks and the staking for the next two weeks. Notify the Engineer 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 Engineer review the locations and make changes as necessary.

3.03 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 Engineer. 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 Engineer-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 Engineer-approved anti-desiccant immediately following planting and during final seasonal watering, according to the manufacturer’s instructions and limitations.

3.04 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.

3.05 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.

3.06 PRUNING

A. Prune new plants as determined by the Engineer. 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 Engineer at least one (1) week prior to pruning operations.

3.07 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 Engineer or the The Jefferson Project 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 The Jefferson Project. 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 Engineer -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 Engineer 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 Engineer. Replenish the mulch around all the plants to the required depth of 5 - 6 inches.

3.08 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.

3.09 SCHEDULES

A. Follow the general planting location, type, and size of tree or shrub as indicated on the Plans. Obtain approval from the Engineer 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 Engineer. Provide the Engineer 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

1.01 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.

1.02 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

1.03 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).

1.04 SOURCE QUALITY CONTROL

A. Test the seed mixture for purity and germination by the Seed Producer within nine (9) months of sowing.

1.05 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

1.06 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 Engineer, 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.

1.07 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.

1.08 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.

1.09 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 Engineer. The Engineer 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 Engineer's approval at the Contractor's expense.

PART 2 PRODUCTS

2.01 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 Engineer.

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
THM	Loamy to Heavy	Home and Business Turf	250 lbs/acre

C. Hydroseed with a blend of seed, fertilizer, and hydromulch.

2.02 MULCHING MATERIAL

A. Straw:

1. Small grain straw or grass or marsh hay acceptable to the Engineer.

B. Wood Excelsior:

1. Green wood fibers, baled or blanket of type and manufacture acceptable to the Engineer.
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 Engineer.
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 Engineer.

2.03 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.

2.04 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.

2.05 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.

2.06 WATER

A. Free of matter harmful to plant growth.

2.07 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.

2.08 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 Engineer 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 Engineer.

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.

2.09 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

3.01 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.

3.02 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.

3.03 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 Engineer 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.

3.04 PLACING AND SPREADING TOPSOIL

A. Place and spread topsoil over the area designated on the Plans, or as determined by the Engineer, 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.

3.05 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.

3.06 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 Engineer 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 Engineer. Distribute the seed slurry mixture uniformly at a rate approved by the Engineer for the seeding and/or mulch materials used to suit the seed application rate. Apply seed at a rate of 300 lbs per acre.

3.07 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.

3.08 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.

3.09 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 Engineer 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 Engineer.

F. Extend the establishment period from the time of seeding until the seeded area has a uniform stand of grass acceptable to the Engineer. 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 The Jefferson Project 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

1.01 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.

1.02 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

1.03 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.

1.04 SUBMITTALS

A. Submit copies of the Sod Growers Certificate to the Engineer, 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 Engineer, submit evidence of topsoil borrow pit agreement for pits used by the Contractor.

C. Submit test results for imported topsoil.

1.05 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.

1.06 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 Engineer.

C. Do not place sod when the ambient air temperature is below 32 degrees F .

1.07 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.

1.08 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.

1.09 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 Engineer.

B. Engineer 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 Engineer's approval at the Contractor’s expense.

PART 2 PRODUCTS

2.01 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

2.02 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.

2.03 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 Engineer.

2.04 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 Engineer review the source and final screen results before releasing the topsoil.

D. Submit a certified analysis of the topsoil from each source to the Engineer. 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.

2.05 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.

2.06 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

3.01 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 Engineer.

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.

3.02 OFF-SITE SOURCE INSPECTION

A. Prior to commencement of sodding operations, notify the Engineer of the off-site sources from which sod is to be furnished. Engineer, at his discretion, will inspect the sod at the off-site source.

3.03 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 Engineer 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 Engineer only after it has been sufficiently watered to moisten the soil to the depth at which the sod is to be cut.

3.04 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.

3.05 PLACING AND SPREADING TOPSOIL

A. Place and spread topsoil over the area indicated on the Plans or as directed by the Engineer. 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.

3.06 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 Engineer, 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 Engineer, pulverize suitable rejected sod and use it for filling, where necessary.

3.07 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 Engineer. 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 32 93 00 - BIOSWALES - BIORETENTION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Section includes furnishing labor, equipment, tools and materials for the construction of stormwater bioswales-bioretention. Items covered in this section include:

1. Bioretention Soil Mixture
2. Compost
3. Underdrain
4. Aggregate
5. Plant Material
6. Mulch
7. Geotextile fabric
8. Infiltration Testing
9. Decorative Aggregate Mulch
10. Stone Pavers
11. Overflow structure
12. Outlet piping

B. The cost of testing and analysis will be at the expense of the Contractor.

1.02 REFERENCE STANDARDS

A. Conform the Work of this Section to the applicable portions of the following Standards, unless otherwise specified.

1. ASTM D5268 - Standard Specification for Topsoil Used for Landscaping and Construction Purposes
2. ASTM D2974 - Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
3. ASTM D3665 - Standard Pratice for Random Sampling of Construction Materials
4. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components
5. ASTM F1632 - Standard Test Method for Particle Size Analysis and Sand Shape Grading of Golf Course Putting Green and Sports Field Rootzone Mixes
6. ASTM F1647 - Standard Test Methods for Organic Matter Content of Athletic Field Rootzone Mixes

1.03 QUALITY ASSURANCE

A. Do not make substitutions. If specified landscape material is not obtainable, submit proof of non-availability to Engineer, together with proposal for use of equivalent material.

B. Qualifications:

1. Engage a single firm specializing in landscape work with a minimum of 5 years' experience who has successfully completed landscaping work similar in material, design, and extent to that indicated for this project and with a record of successful landscape establishment.

2. Require installers to maintain an experienced full-time Supervisor on the project site during times that construction including planting is in progress.

C. Testing Agency:

1. To qualify for acceptance, an independent testing agency must demonstrate to Engineer's satisfaction, based on evaluation of agency-submitted criteriaconforming to ASTM E699, that it has the experience and capability to satisfactorilyconduct the testing indicated without delaying the Work.

2. The testing Agency shall be accredited by the American Association of Laboratory Accreditation and/or on theUSGA preferred labs list.

D. As-Built Drawings:

1. During course of installation, carefully record in red line on a print of the planting drawings all changes made to the planting system layout during installations.

2. Final payment for planting will not be authorized until an accurate and complete as-built is submitted.

1.04 DEFINITIONS

A. Bioswale Bioretention is a shallow cell beds graded and landscaped to collect stormwater. Water from across the subject site enters via sheet flow or through a controlled inlet. Most of the cell bed consists of an engineered soil mix and an aggregate storage layer that may or may not be augmented with storage chambers or pipe-bundles. In the center of the cell is a segment containing engineered soils and an underdrain system to help assure positive drainage. The underdrain flows to an overflow riser at one end of the cell bed.

B. Bioretention Soil Mixture (BSM): A mixture of compost and sand.

C. Organic Compost: Use organic compost derived from plant material in the BSM and soil-conditioned areas, resulting from biological degradation and transformation of plant-derived materials under conditions promoting anaerobic decomposition.

1.05 SUBMITTALS

A. Bioretention Soil Mixture:

1. Submit representative samples, certificates, manufacturer's literature, and certified tests for materials specified below to the Engineer at least 30 days but no more than 60 days prior to starting work. Do not order materials until the Engineer has reviewed and approved the required samples, certificates, manufacturer's literature, and test results. Ensure delivered materials closely match the approved samples. Approval does not constitute final

acceptance. The Engineer reserves the right to reject any material, on or after delivery, that does not meet these specifications.

a. Submit two, one-half cubic foot representative samples of Bioretention Soil

1) Mixture, and two one-half cubic foot representative samples of compost defined

2) Samples shall be taken randomly throughout the field or stockpile. Samples shall be labeled to include the location of the source of material, the date of the sample and the Contractor’s name. One of the two samples of each material shall be submitted to a testing laboratory for analysis. The second

3) Submit compost for chemical analysis, performed in accordance with current AOAC Standards, including the following:

(a) pH and Buffer pH.

(b) Percent organic matter as determined by the loss of ignition of oven dried samples.

(1) Test samples shall be oven dried to a constant weight at a temperature of 230 degrees F, plus or minus 9 degrees.

(c) Analysis for nutrient levels by parts per million including calcium, magnesium and micronutrient levels.

(1) Nutrient test shall include the testing laboratory recommendations for supplemental additions to the soil as calculated by the amount of material to be added per volume of soil for the type of plants to be grown in the soil.

(d) Soluble salt by electrical conductivity of a 1:2 soil/water sample measured in milliohm per cm.

(e) Nitrogen Ratio.

(f) Bioretention Soil Mixture: Submit to the Engineer the source/supplier and a 1 gallon sample in a sealed Zip-Loc bag.Compost: Submit to the Engineer the source/supplier and a 1 gallon sample in a sealed Zip-Loc bag.Sand: Submit to the Engineer the source/supplier and a 1 gallon sample in a sealed Zip-Loc bag.

(1) Submit to the Engineer the source/supplier and a 1 gallon sample in a sealed Zip-Loc bag.

(g) Compost:

(1) Submit to the Engineer the source/supplier and a 1 gallon sample in a sealed Zip-Loc bag.

(h) Sand:

(1) Submit to the Engineer the source/supplier and a 1 gallon sample in a sealed Zip-Loc bag.

(i) Plug and Containerized Plant Material:

(1) Submit list of sources for all plant materials for approval within 8 weeks after the approval of the contract for construction. Plant Material Sources shall include the names and locations of nurseries proposed as sources of acceptable plant materials and a list of the plants each nursery shall provide. The plant list shall include the botanical and common name and the size at the time of selection. Inspect all nursery materials to determine that the materials meet the requirements of this section. All Plant material shall be propagated and procured from a growing nursery in horticultural zone 9. Resale plant suppliers shall not be used as sources unless the Contractor can certify that the required plant materials are not available from a growing nursery. When utilized, the Contractor shall submit the name and location of the growing nursery from where the plugs were obtained.

4) Plant and Material Certifications:

(a) Minimum of three (3) digital photographs of the nursery providing plant materials for review and approval by Engineer Provide one photo each of the business sign and main office;

(b) Three (3) digital photographs representative of each plant plug species to be provided for review and approval by Engineer. The digital photographs shall be legible and clearly depict the plant specimen. Each submitted image shall contain a height reference, such as a measuring stick. The approval of the plant materials by the Engineer via photograph does not preclude the Engineer’s right to reject materials upon arrival at the site.

(c) Certificates of inspection as required by governmental authorities.

(d) Label data substantiating that plant materials comply with specified requirements.

(e) Manufacturers Literature: Submit copies of organic (bio) fertilizer and bio-stimulants.

2. During course of installation, carefully record in red line on a print of the planting drawings all changes made to the planting system layout during installations; approved by the Engineer. Final payment for planting will not be authorized until an accurate and complete as-built is submitted.

(1)

(2) During course of installation, carefully record in red line on a print of the planting drawings all changes made to the planting system layout during installations; approved by the Engineer. Final payment for planting will not be authorized until an accurate and complete as-built is submitted.

(3) Proposed planting schedule, indicating dates for each type of landscape work

PART 2 PRODUCTS

PART 3 EXECUTION

PART 4 MEASUREMENT AND PAYMENT

PART 5 END OF SECTION

SECTION 33 41 00 - STORM UTILITY DRAINAGE PIPING

PART 1 GENERAL

1.01 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.

1.02 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

1.03 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)

1.04 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.

1.05 SUBMITTALS

A. Submit a complete field report of the location of all wye openings and sump pump discharge leads to the Engineer 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 Engineer.

C. Submit complete Shop Drawings for all manhole tees to the Engineer.

D. Submit shop drawings and design information for all precast concrete box sections.

1.06 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.

1.07 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 Engineer.

B. Use lifting devices suited to the Work and designed to protect surfaces from damage.

PART 2 PRODUCTS

2.01 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.

2.02 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.

2.03 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.

2.04 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 Engineer 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.

2.05 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.

2.06 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.

2.07 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.

2.08 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.

2.09 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 Engineer 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 Engineer'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

3.01 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.

3.02 EXISTING STORM SEWERS AND DRAINS

A. Expose the existing storm sewer and structures designated for connection with the new Work and notify the Engineer. Allow the Engineer 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.

3.03 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.

3.04 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.

3.05 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.

3.06 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.

3.07 UNDERDRAINS

A. Lay the pipe in close conformity with the lines or grades shown on the Plans or established by the Engineer.

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.

3.08 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.

3.09 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

1.01 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.

1.02 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

1.03 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.

1.04 JOB CONDITIONS

A. Carefully protect trees, shrubs, and other vegetation outside the Work limits designated on the Plans or by the Engineer 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

3.01 PERFORMANCE – GENERAL

A. Begin construction at the outlet end of the open drain and proceed upstream, unless the Engineer 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.

3.02 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 Engineer.

3.03 CLEARING AND GRUBBING

A. Clear and grub the drain right-of-way and spoil deposit areas, designated on the Plans or determined by the Engineer, 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.

3.04 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 Engineer.

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 Engineer.

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.

3.05 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 Engineer when wet or unstable soil conditions are encountered during excavation. With the Engineer’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 Engineer 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 Engineer.

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 Engineer’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 Engineer upon encountering ledge rock.

I. Blasting will not be permitted unless otherwise specified on the Plans or approved by the Engineer.

3.06 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 Engineer immediately before placing slope protective materials.

E. Trimming and finishing the earth grade will be considered incidental to the excavation.

3.07 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 Engineer, 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.

3.08 SLOPE STABILIZATION

A. After completing the grading operation and before placing any protective covering, have the Engineer 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.

3.09 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 Engineer may be relayed.

C. Repair any culverts with scraped or otherwise damaged protective coating to the Engineer’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 Engineer 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 Engineer.

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 Engineer 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 Engineer 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