SECTION 00 01 00
CONTRACT DOCUMENTS

DWSRF 2025 WATER MAIN REPLACEMENT - PHASE 14

Charter Township of Redford
15145 Beech Daly Road
Redford, MI 48239

05-23-2025

25251 Northline Road, Taylor MI, 48180

RDF 2103-03T

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ADVERTISEMENT FOR BIDS

DWSRF 2025 Water Main Replacement - Phase 14

The Charter Township of Redford will be receiving sealed bids at the office of the Township Clerk,15145 Beech Daly Road, Redford, MI 48239, until 3:00 pm, local time, 06-26-2025, at which time and place said Bids will be opened and publicly read aloud for the following work/project.

Replacement of approximately 5.5 miles of water main along various streets by pipe bursting. Related gate valves, hydrants, and fittings will be open cut. Directional drilling will occur beneath Joy Rd, Wadsworth St, Farley St, and the DPS Service Dr.

Bids will only be received by the Charter Township of Redford by mail or in person to the Redford Township Clerk's Office, 15145 Beech Daly Road, Redford, MI 48239. It is the Bidder's sole responsibility to ensure Bid is received before the date and time of the bid opening noted above. Bids will not be accepted through QuestCDN.

Attention is called to the Project being funded by the State Revolving Fund and must adhere to the requirements for non-equivalency projects. Bidders should note the requirements from EGLE included in this project and shall abide by the Federal Wage Rate Determination which is referred to or contained in the Project Manual.

Contract Documents may be examined at the following locations:

Contract Documents for bidding purposes are only available from QuestCDN starting on 05-23-2025. Contract Documents can be viewed and downloaded by registering for free with QuestCDN online (www.questcdn.com) or by calling 952-233-1632. The QuestCDN Project Number for this project is 9701953 and may be used to look up the project.

A. There is a Twenty Two Dollars ($22.00) nonrefundable fee for downloading the Contract Documents in pdf format. Bidders must download the Documents from QuestCDN to be included on the Plan Holders List and to receive any Addenda posted for the project.

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

Redford Township will not consider or accept a bid received after the date and time specified for bid submission. No oral, e-mail, telephonic or telegraphic proposals will be considered.

Instructions regarding forms/information are contained in this language and must be carefully, reviewed, completed, and included with any submitted Bid: American Iron & Steel (AIS), Davis-Bacon and Related Acts/Prevailing Federal Wages, Labor Standards Provisions for Federally Assisted Projects, and Certification Regarding Debarment, Suspension, and Other Responsibility Matters.

A non-mandatory pre-bid conference will be held on 06-11-2025 at 2:00 PM, Local Time in person at the Leo Snage Public Services Building, 12200 Beech Daly Road, Redford, MI 48239 (DPS Conference Room). Representatives of the Owner and the Engineer will be present to discuss the project. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference.

Each Bid must be accompanied by a Bid Bond by a recognized Surety Company in the amount of 5 percent (5%) of the bid, drawn payable to Charter Township of Redford, as security for the proper execution of the Contract.

Any questions regarding the Request for Proposal will be directed to Kelly McRobb-Ackland, Project Engineer at kackland@wadetrim.com. Questions will be received until June 19, 2025 at 5:00 PM. No further questions will be answered after this date and time. Questions will be received until 06-19-2025 at 5:00 PM. No further questions will be answered after this date and time.

The Charter Township of Redford reserves the right to accept or reject any and all proposals, to waive defects in proposals, to enter negotiations with any applicant, to re-solicit for proposals and to conduct an application evaluation review meeting with any and all applicants. The Township will not be responsible for any costs or fees associated with the preparation of a response to this request for qualifications.

No proposals may be withdrawn for a period of 90 calendar days following the due date.

This project is funded through the State of Michigan Drinking Water State Revolving Fund (DWSRF).

The Contractor and Subcontractors on this project must comply with all applicable Nondiscrimination Laws, Equal Employment Opportunity, Affirmative Action, Anti-Kickback Act, Federal Occupational Safety and Health Act and Department of Labor Standards and Regulations as set forth in the Contract Bid Documents. This municipality is an equal opportunity employer; businesses owned by women or minorities are strongly encouraged to bid. The Contractor shall comply with all the provisions of the Charter Township of Redford. The Contracto must also ensure that employees and applicants for employment are not discriminated against because of their, but not limited to, race, color, religion, sex, national origin including limited English proficiency.

Karla M. Sanders

Township Clerk

Charter Township of Redford

Wade Trim Associates, Inc.

25251 Northline Road, Taylor MI, 48180

Publish: 05-23-2025

SECTION 00 21 13 - INSTRUCTIONS TO BIDDERS

PART 1 GENERAL

1.01 DEFINED TERMS

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

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

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

D. The term "Owner" means Charter Township of Redford, 15145 Beech Daly Road, a Municipal Corporation and being a party of the first part of this Contract.

E. The term “Engineer” means Wade Trim Associates, Inc., 25251 Northline Road, Taylor MI, 48180, or a duly authorized representative.

1.02 BIDDERS QUALIFICATIONS

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

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

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

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

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

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

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

1.03 EXAMINATION OF CONTRACT DOCUMENTS AND SITE

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

1. Examine the Contract Documents thoroughly,

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

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

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

5. Promptly notify the Engineer 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 Engineer 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 Engineer in preparing the Contract Documents.

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

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

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

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

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

E. The locations of utilities as shown on the Plans are taken from sources believed to be reliable. Neither the Owner nor the Engineer 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 Engineer written notice of all conflicts, errors, ambiguities and

discrepancies that Bidder has discovered in Contract Documents and the resolution by the Engineer 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 in-person, non-mandatory pre-bid conference will be held, and representatives of the Owner and the Engineer will be present to discuss the Project.

B. Engineer will transmit to prospective Bidders a record of such Addenda as the Engineer 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 Engineer for an interpretation thereof. The person submitting the request will be held responsible for its prompt delivery at least seven (7) days prior to the date for opening of Bids. Questions received less than seven (7) days prior to the date for opening of bids will not be answered. Any interpretation of inquiry will be made by Addendum duly issued to all prospective bidders.

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

1.06 BID SECURITY

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

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

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

1.07 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 Engineer, application for such acceptance will not be considered by the Engineer until after the effective date of the Agreement.

C. In addition, in no case will the Engineer’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 Engineer.

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

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

E. The quantities as shown in Section 00 42 43 - Proposal are approximate only and will be used as a basis of comparison of Bids, and award of Contract(s).

1. Payment will be made on basis of actual quantities of Work performed in accordance with the Contract Documents.

F. Unit Prices must include such amounts as the Bidder deems proper for overhead, profit, taxes, General Conditions and such other incidentals as noted in the Contact Documents.

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

H. 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.

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

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

K. To obtain Contract Documents, Bidders:

1. Must proceed to the Wade Trim website at www.wadetrim.com/Resources and click on the QuestCDN link, which will direct Bidder to Wade Trim's QuestCDN electronic bidding project list.

a. Register for a free membership on QuestCDN and download the Contract Documents in digital form under "Download Bid Documents." There is a non-refundable fee(s) as stated in Section 00 11 13 to download the documents.

b. Sign into your account or create a free QuestCDN account by clicking the "Join" link. Contact QuestCDN at (952) 233-1632 or info@questcdn.com for assistance regarding membership registration, downloading the project, and vBid online bid submittal.

c. Access the Bid Form via Section 00 42 43 Proposal.

1) Prospective Bidders may only submit the Bid Form as provided on the Proposal.

2) If Prospective Bidders submit their own bid form and that form does not match the Bid Form provided on the Proposal in terms of bid items, quantities, alternatives, etc., the submitted bid may be subject to rejection.

d. Addenda will be issued through the QuestCDN electronic bidding site. **Prospective Bidders must download the bid documents to become a plan holder and receive addenda notices.** It is the sole responsibility of the Bidder to obtain and review all addenda.

L. To submit a Bid, Bidders:

1. Must send completed forms by mail, directed to the Clerk's office as described in the Advertisement, or

2. Must send completed forms in person. Directed to the Clerk's office as described in the Advertisement.

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 Owner and promptly thereafter demonstrates to the reasonable satisfaction of the Owner that there was a material and substantial mistake in the preparation of their Bid, that Bidder may withdraw their Bid and the Bid Security will be returned.

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

1.11 AWARD OF CONTRACT

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

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

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

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

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

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

G. If the Contract is to be awarded, the Owner will give the Successful Bidder a Notice of Award within 90 days after the day of the Bid opening, unless such other time is specified in the Advertisement for Bids.

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

1.12 SIGNING OF AGREEMENT

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

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

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 00 42 43
PROPOSAL

Owner: Charter Township of Redford

Project: DWSRF 2025 Water Main Replacement – Phase 14

Project Location: Varies

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 Charter Township of Redford 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 05-23-2025 and Project Manual dated 05-23-2025) 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: _____

BASE BID: AREAS 1, 2, 3, AND 4

No.	Description	Est. Quantity	Unit	Bid Unit Price	Bid Price
1	Allowance for Permit Fees	1	LS	$25,000.00	$25,000.00
2	Audio/Video Route Survey	1	LS	$	$
3	Inspector Days, SRF Ineligible (Contractor to bid number of days)	950	DLR		$
4	Mobilization, Max 5%	1	LS	$	$
5	Traffic Maintenance and Control	1	LS	$	$
6	Inlet Filter	119	EA	$	$
7	Exploratory Excavation for Existing Utilities	10	EA	$	$
8	Water Main, 6 inch, Remove	120	LF	$	$
9	End Section, 12 inch, Remove	1	EA	$	$
10	Pavement, Remove and Excavate	9,863	SY	$	$
11	Concrete Sidewalks and Drives, Remove	24,602	SF	$	$
12	Guardrail, Remove	25	LF	$	$
13	Wall, Remove	84	LF	$	$
14	Allowance for Irrigation Damage	1	LS	$25,000.00	$25,000.00
15	Tree, Remove	1	EA	$	$
16	Structure, Adjust	50	EA	$	$
17	Subgrade Undercut and 21AA Backfill	83	CY	$	$
18	Maintenance Aggregate	812	TON	$	$
19	Aggregate Base Course, 21AA	3,529	TON	$	$
20	Bituminous Leveling Course, 4E10, 2 inch	47	TON	$	$
21	Bituminous Base Course, 4E10, 4 inch	36	TON	$	$
22	Bituminous Wearing Course, 5E10, 1.5 inch	62	TON	$	$
23	Bituminous Wearing Course, 5E10, 2 inch	19	TON	$	$

No.	Description	Est. Quantity	Unit	Bid Unit Price	Bid Price
24	Concrete Pavement w/ Integral Curb, 7 inch	8,149	SY	$	$
25	Concrete Pavement w/ Integral Curb, 8 inch	203	SY	$	$
26	Concrete Pavement w/ Integral Curb, 9 inch	814	SY	$	$
27	Sidewalk, Concrete, 4 inch	10,700	SF	$	$
28	Sidewalk, Ramp and Landing, ADA, Concrete, 6 inch	4,298	SF	$	$
29	Drive and Sidewalk, Concrete, 6 inch	6,529	SF	$	$
30	Restoration w/ 3 inches Topsoil, Seed, Fertilizer, and Mulch	41,182	SY	$	$
31	Gate Valve and Well, Abandon	6	EA	$	$
32	Gate Valve and Well, Remove	26	EA	$	$
33	Fire Hydrant, Remove	31	EA	$	$
34	Existing Water Main, 6 inch, Abandon with Flowable Fill	26	CY	$	$
35	Existing Water Main, 8 inch, Abandon with Flowable Fill	1	CY	$	$
36	Cut and Plug Existing 6 inch Water Main	12	EA	$	$
37	Cut and Plug Existing 8 inch Water Main	5	EA	$	$
38	Water Main, 8 inch, HDPE SDR 11, Enclosed in Steel Casing	160	LF	$	$
39	Water Main, 8 inch, HDPE SDR 11, Directional Bore	1,487	LF	$	$
40	Water Main, 12 inch, HDPE SDR 11, Directional Bore	2,141	LF	$	$
41	Water Main, 8 inch, HDPE SDR 11, Pipe Burst Ex 6 inch	20,420	LF	$	$
42	Water Main, 8 inch, HDPE SDR 11, Pipe Burst Ex 8 inch	328	LF	$	$
43	Water Main, Connection to Existing, 6 inch MJ Solid Sleeve	2	EA	$	$
44	Water Main, Connection to Existing, 8 inch MJ Solid Sleeve	4	EA	$	$
45	Water Main, Connection to Existing, 8 inch x 8 inch Tee and Cutting In Sleeve	10	EA	$	$
46	Water Main, Connection to Existing, 12 inch x 8 inch Tee and Cutting In Sleeve	7	EA	$	$

No.	Description	Est. Quantity	Unit	Bid Unit Price	Bid Price
47	Water Main, Connection to Existing, 16 inch x 8 inch Tee and Cutting In Sleeve	4	EA	$	$
48	Water Service, Connection to Water Main, Corp and Saddle	486	EA	$	$
49	Water Service, Water Main to Property Line, K Copper, 1 inch, Short, Trench B	282	EA	$	$
50	Water Service, Water Main to Property Line, K Copper, Greater Than 1 inch, Short, Trench B	3	EA	$	$
51	Water Service, Water Main to Property Line, K Copper, 1 inch, Long, Directional Bored	289	EA	$	$
52	Water Service, Water Main to Property Line, K Copper, Greater Than 1 inch, Long, Directional Bored	3	EA	$	$
53	Curb Stop and Box, 1 inch	571	EA	$	$
54	Curb Stop and Box, Greater Than 1 inch	5	EA	$	$
55	Fire Hydrant Assembly	67	EA	$	$
56	Tapping Sleeve, 12 inch x 8 inch, Valve and Well	1	EA	$	$
57	Gate Valve and Well, 6 inch	1	EA	$	$
58	Gate Valve and Well, 8 inch	44	EA	$	$
59	Gate Valve and Well, 12 inch	2	EA	$	$
60	Water Service, Water Main to Property Line, K Copper, 1 inch, Short, Trench B (LSLR)	11	EA	$	$
61	Water Service, Water Main to Property Line, K Copper, 1 inch, Long, Directional Bored (LSLR)	13	EA	$	$
62	Curb Stop and Box, 1 inch (LSLR)	24	EA	$	$
63	Water Service, Property Line to Meter, K Copper, 1 inch, Directional Bored (LSLR)	24	EA	$	$
64	Water Service, Connection to Water Meter (LSLR)	24	EA	$	$
65	Cleaning, Sanitary Sewer, 12 inch	2,477	LF	$	$
66	Cleaning, Sanitary Sewer, 15 inch	2,168	LF	$	$
67	Cleaning, Sanitary Sewer, 18 inch	3,009	LF	$	$
68	Cleaning, Sanitary Sewer, 24 inch	280	LF	$	$

No.	Description	Est. Quantity	Unit	Bid Unit Price	Bid Price
69	Cleaning, Sanitary Sewer, 32 inch	1,299	LF	$	$
70	Cleaning, Sanitary Sewer, 36 inch	2,435	LF	$	$
71	Pre-Television Inspection, Sanitary Service, Mainline to Property Line	218	EA	$	$
72	Post-Television Inspection, Sanitary Service, Mainline to Property Line, SRF Ineligible	218	EA	$	$
73	Sanitary Service, Remove and Replace	5	EA	$	$
74	End Section With Animal Grate For 12 Inch Culvert, Concrete	1	EA	$	$
75	Guardrail, Type T	25	LF	$	$
76	Guardrail, Reflectors	15	EA	$	$
	Total Base Bid Price			**$**	

ADDITIVE ALTERNATIVE 1: AREA 5

No.	Description	Est. Quantity	Unit	Bid Unit Price	Bid Price
77	Alt 1: Audio/Video Route Survey	1	LS	$	$
78	Alt 1: Inspector Days, SRF Ineligible (Contractor to bid number of days)	950	DLR		$
79	Alt 1: Mobilization, Max 5%	1	LS	$	$
80	Alt 1: Traffic Maintenance and Control	1	LS	$	$
81	Alt 1: Inlet Filter	34	EA	$	$
82	Alt 1: Exploratory Excavation for Existing Utilities	2	EA	$	$
83	Alt 1: Pavement, Remove and Excavate	130	SY	$	$
84	Alt 1: Concrete Sidewalks and Drives, Remove	1,106	SF	$	$
85	Alt 1: Allowance for Irrigation Damage	1	LS	$2,500.00	$2,500.00
86	Alt 1: Subgrade Undercut and 21AA Backfill	4	CY	$	$
87	Alt 1: Maintenance Aggregate	37	TON	$	$
88	Alt 1: Aggregate Base Course, 21AA	43	TON	$	$
89	Alt 1: Bituminous Leveling Course, 4E10, 2 inch	15	TON	$	$
90	Alt 1: Bituminous Wearing Course, 5E10, 1.5 inch	11	TON	$	$
91	Alt 1: Concrete Pavement w/ Integral Curb, 9 inch	130	SY	$	$
92	Alt 1: Sidewalk, Concrete, 4 inch	1,025	SF	$	$
93	Alt 1: Sidewalk, Ramp and Landing, ADA, Concrete, 6 inch	81	SF	$	$
94	Alt 1: Restoration w/ 3 inches Topsoil, Seed, Fertilizer, and Mulch	8,920	SY	$	$
95	Alt 1: Gate Valve and Well, Remove	5	EA	$	$
96	Alt 1: Fire Hydrant, Remove	7	EA	$	$
97	Alt 1: Existing Water Main, 8 inch, Abandon with Flowable Fill	5	CY	$	$
98	Alt 1: Cut and Plug Existing 8 inch Water Main	4	EA	$	$
99	Alt 1: Water Main, 12 inch, HDPE SDR 11, Directional Bore	282	LF	$	$

No.	Description	Est. Quantity	Unit	Bid Unit Price	Bid Price
100	Alt 1: Water Main, 12 inch, HDPE SDR 11, Pipe Burst Ex 8 inch	2,414	LF	$	$
101	Alt 1: Water Main, Connection to Existing, 8 inch MJ Solid Sleeve	2	EA	$	$
102	Alt 1: Water Main, Connection to Existing, 12 inch x 8 inch Tee and Cutting In Sleeve	2	EA	$	$
103	Alt 1: Water Main, Connection to Existing, 16 Inch x 12 inch Tee and Cutting In Sleeve	1	EA	$	$
104	Alt 1: Water Service, Water Main to Property Line, K Copper, Greater Than 1 inch, Long, Directional Bored	21	EA	$	$
105	Alt 1: Curb Stop and Box, Greater Than 1 inch	21	EA	$	$
106	Alt 1: Fire Hydrant Assembly, Pipe Burst to Mainline	7	EA	$	$
107	Alt 1: Fire Hydrant Assembly, Directional Bore to Mainline	8	EA	$	$
108	Alt 1: Insertion Valve and Well, 16 Inch	2	EA	$	$
109	Alt 1: Gate Valve and Well, 12 inch	5	EA	$	$
110	Alt 1: Water Service, Water Main to Property Line, K Copper, 1 inch, Short, Trench B (LSLR)	1	EA	$	$
111	Alt 1: Water Service, Water Main to Property Line, K Copper, 1 inch, Long, Directional Bored (LSLR)	1	EA	$	$
112	Alt 1: Curb Stop and Box, 1 inch (LSLR)	2	EA	$	$
113	Alt 1: Water Service, Property Line to Meter, K Copper, 1 inch, Directional Bored (LSLR)	2	EA	$	$
114	Alt 1: Water Service, Connection to Water Meter (LSLR)	2	EA	$	$
115	Alt 1: Sanitary Service, Remove and Replace	1	EA	$	$
	Total Additive Alternative 1 Price			**$**	

Total Contract Price (Base + Alt 1)	**$**

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

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

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

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

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

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

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

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

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

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

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

Proposals may not be withdrawn for a period of 90 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

D. Statement of Qualifications

E. Certification Regarding Debarment, Suspension, and Other Responsibility Matters

SECTION 00 43 13
BID BOND FORM

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

WHEREAS, the Principal has submitted a Bid for DWSRF 2025 Water Main Replacement - Phase 14.

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

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

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

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

Finance Division

NON-EQUIVALENCY PROJECTS CONTRACT BOILERPLATE LANGUAGE

Instructions:
The following is the required standard contract language that must appear in bidding documents of Clean Water State Revolving Fund and Drinking Water State Revolving Fund non-equivalency projects. Determination of equivalent vs. non-equivalent projects is made on a yearly basis as indicated in the Intended Use Plan (IUP) and will be communicated by your EGLE project manager. If you are unsure whether your project is equivalent, consult with your EGLE project manager.

- **American Iron & Steel Contract Language**
- **Davis-Bacon and Related Acts/Prevailing Federal Wages**
- **Labor Standards Provisions for Federally Assisted Projects**
- **Certification Regarding Debarment, Suspension, and Other Responsibility Matters*****

***Bidders should note this section contains instructions regarding forms/information that must be completed and included with any submitted bid.

American Iron and Steel Contract Language

The Contractor acknowledges to and for the benefit of the Charter Township of Redford ("Purchaser") and the Michigan Department of Environment, Great Lakes, and Energy (the "State") that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or the Drinking Water State Revolving Fund and such laws contain provisions commonly known as "American Iron and Steel (AIS);" that requires all iron and steel products used in the project be produced in the United States ("AIS Requirements") including iron and steel provided by the Contractor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State that (a) the Contractor has reviewed and understands the AIS Requirements, (b) all iron and steel used in the project will be and/or have been produced in the United States in a manner that complies with the AIS Requirements, unless a waiver of the requirements is approved or the State made the determination in writing that the AIS Requirements do not apply to the project, and (c) the Contractor will provide any further verified information, certification, or assurance of compliance with this paragraph, or information necessary to support a waiver of the AIS requirements, as may be requested by the Purchaser.

Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser). While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

Davis-Bacon and Related Acts/Prevailing Federal Wages

P.L. 111-88 requires compliance with the Davis Bacon Act and adherence to the current U.S. Department of Labor Wage Decision. Attention is called to the fact that not less than the minimum salaries and wages as set forth in the Contract Documents (see Wage Decision included herein) must be paid on this project. The Wage Decision, including modifications, must be posted by the Contractor on the job site. The “Contracting Agency” or “Contracting Officer” for Davis-Bacon Wage Decision posters on jobsites is the loan applicant/bond issuer. A copy of the Labor Standards Provisions for Federally Assisted Projects is included and is hereby a part of this contract.

"General Decision Number: MI20250075 02/21/2025

Superseded General Decision Number: MI20240075

State: Michigan

Construction Type: Heavy

County: Wayne County in Michigan.

Heavy, Includes Water, Sewer Lines and Excavation (Excludes Hazardous Waste Removal; Coal, Oil, Gas, Duct and other similar Pipeline Construction)

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $17.75 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $13.30 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2025.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/03/2025

1 02/21/2025

BOIL0169-003 01/01/2024

	Rates	Fringes
BOILERMAKER	$ 39.65	35.68

CARP0687-008 06/01/2024

	Rates	Fringes
CARPENTER, Includes Form Work	$ 38.48	30.22
PILEDRIVERMAN	$ 38.48	30.22

* ELEC0017-003 06/01/2024

	Rates	Fringes
LINE CONSTRUCTION:		
Linemen/Cable Splicer	$ 58.56	29%+7.44

ELEC0058-007 06/28/2024

	Rates	Fringes
ELECTRICIAN	$ 51.32	28.54

ENGI0325-019 09/01/2024

POWER EQUIPMENT OPERATORS: Underground Construction (Including Sewer)

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
GROUP 1	$ 43.48	25.25
GROUP 2	$ 38.75	25.25
GROUP 3	$ 38.02	25.25
GROUP 4	$ 37.45	25.25

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Backhoe/ Excavator, Boring Machine, Bulldozer, Crane, Grader/ Blade, Loader, Roller, Scraper, Trencher (over 8 ft. digging capacity)

GROUP 2: Trencher (8-ft digging capacity and smaller)

GROUP 3: Boom Truck (non-swinging, non- powered type boom)

GROUP 4: Broom/ Sweeper, Fork Truck, Tractor, Bobcat/ Skid Steer /Skid Loader

ENGI0326-008 06/01/2024

EXCLUDES UNDERGROUND CONSTRUCTION

	Rates	Fringes
OPERATOR: Power Equipment		
GROUP 1	$ 49.54	25.35
GROUP 2	$ 48.04	25.35

GROUP 3	$ 46.54	25.35
GROUP 4	$ 46.24	25.35
GROUP 5	$ 45.42	25.35
GROUP 6	$ 44.56	25.35
GROUP 7	$ 43.59	25.35
GROUP 8	$ 41.88	25.35
GROUP 9	$ 31.79	25.35

FOOTNOTES: Tower cranes: to be paid the crane operator rate determined by the combined length of the mast and the boom.

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Crane with boom & jib or leads 400' or longer

GROUP 2: Crane with boom & jib or leads 300' or longer

GROUP 3: Crane with boom & jib or leads 220' or longer

GROUP 4: Crane with boom & jib or leads 140' or longer

GROUP 5: Crane with boom & jib or leads 120' or longer

GROUP 6: Regular crane operator

GROUP 7: Backhoe/Excavator, Bobcat/Skid Loader, Boring Machine, Broom/Sweeper, Bulldozer, Grader/Blade, Loader, Roller, Scraper, Tractor, Trencher

GROUP 8: Forklift

GROUP 9: Oiler

IRON0025-006 06/01/2024

	Rates	Fringes
IRONWORKER		
Reinforcing	$ 33.43	37.15
Structural	$ 35.55	35.83

LABO0334-009 06/01/2024

EXCLUDES OPEN CUT CONSTRUCTION

	Rates	Fringes
Landscape Laborer		
GROUP 1	$ 28.60	11.60
GROUP 2	$ 26.34	11.60

LANDSCAPE LABORER CLASSIFICATIONS

GROUP 1: Landscape specialist, including air, gas and diesel equipment operator, lawn sprinkler installer and skidsteer (or equivalent)

GROUP 2: Landscape laborer: small power tool operator, material mover, truck driver and lawn sprinkler installer tender

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* LABO0334-021 09/01/2022

SCOPE OF WORK:
OPEN CUT CONSTRUCTION: Excavation of earth and sewer, utilities, and improvements, including underground piping/conduit (including inspection, cleaning, restoration, and relining)

	Rates	Fringes
LABORER		
(1) Common or General	$ 23.87	16.95
(2) Mason Tender-Cement/Concrete	$ 23.98	16.95
(4) Grade Checker	$ 24.11	16.95
(5) Pipelayer	$ 24.17	16.95
(7) Landscape	$ 16.79 **	16.80

LABO1191-004 06/01/2024

EXCLUDES OPEN CUT CONSTRUCTION

	Rates	Fringes
Laborers:		
Common or General; Grade Checker; Mason Tender - Cement/Concrete; Pipelayer	$ 35.34	17.75

PAIN0022-005 07/01/2008

	Rates	Fringes
PAINTER		
Brush & Roller	$ 25.06	14.75
Spray	$ 25.86	14.75

PLAS0067-002 04/01/2014

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 30.63	14.07

PLUM0098-005 06/01/2019

	Rates	Fringes
PLUMBER	$ 35.77	35.13

PLUM0636-002 06/05/2017

	Rates	Fringes
PIPEFITTER	$ 40.41	29.35

TEAM0007-006 06/01/2024

	Rates	Fringes
TRUCK DRIVER		
Dump Truck under 8 cu. yds.; Tractor Haul Truck	$ 32.40	.75 + a+b
Dump Truck, 8 cu. yds. and over	$ 32.50	.75 + a+b
Lowboy/Semi-Trailer Truck	$ 32.65	.75+ a+b

FOOTNOTE:
a. $470.70 per week.
b. $68.70 daily.

SUMI2010-073 11/09/2010

	Rates	Fringes
TRUCK DRIVER: Off the Road Truck	$ 20.82	3.69

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($17.75) or 13658 ($13.30). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than

""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination.

The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor

200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION"

§5.5 Contract provisions and related matters.

(a) The Agency head shall cause or require the contracting officer to insert in full in any contract in excess of $2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a public building or public work, or building or work financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated),and which is subject to the labor standards provisions of any of the acts listed in Sec. 5.1, the following clauses (or any modifications thereof to meet the particular needs of the agency, *Provided,* That such modifications are first approved by the Department of Labor):

(1) Minimum wages. (i) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in Sec. 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii)(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination, and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers, or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-dayperiod that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii) (B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fid fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside, in a separate account, assets for the meeting of obligations under the plan or program.

(2) *Withholding.* The ***(write in name of Federal Agency or the loan or grant recipient)*** shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action

as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) *Payrolls and basic records.* (i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the (write in name of appropriate federal agency) if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the (write in name of agency). The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead, the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at dol.gov/agencies/whd/government-contracts/construction/forms or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the (write in name of appropriate federal agency) if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit them to the applicant, sponsor, or owner, as the case may be, for transmission to the (write in name of agency), the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, sponsor, or owner).

(B) Each payroll submitted shall be accompanied by a “Statement of Compliance”, signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under Sec. 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under Sec. 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the “Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the Michigan Department of Environment, Great Lakes, and Energy or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the contractor, sponsor, applicant, or owner, take such action as maybe necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) *Apprentices and trainees*- (i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the jobsite in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates

(expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) *Compliance with Copeland Act requirements.* The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) *Subcontracts*. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the (write in the name of the Federal agency) may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) *Contract termination: debarment*. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) *Compliance with Davis-Bacon and Related Act requirements.* All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) *Disputes concerning labor standards.* Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

(10) *Certification of eligibility.* (i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C.1001.

(b) Contract Work Hours and Safety Standards Act. The Agency Head shall cause or require the contracting officer to insert the following clauses set forth in paragraphs (b)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Sec. 5.5(a) or 4.6 of part 4 of this title. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(c) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible there for shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The ***(write in the name of the Federal agency or the loan or grant recipient)*** shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

(5) In addition to the clauses contained in paragraph (b), in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in Sec.5.1, the Agency Head shall cause or require the contracting officer to insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Agency Head shall cause or require the contracting officer to insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the Michigan Department of Environment, Great Lakes, and Energy and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

Certification Regarding Debarment, Suspension, and Other Responsibility Matters

The prime contractor must provide a completed *Certification Regarding Debarment, Suspension, and Other Responsibility Matters Form* with its bid or proposal package to the owner.

The prospective participant certifies, to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in transactions under federal nonprocurement programs by any federal department or agency;

(2) Have not, within the three-year period preceding the proposal, had one or more public transactions (federal, state, or local) terminated for cause or default; and

(3) Are not presently indicted or otherwise criminally or civilly charged by a government entity (federal, state, or local) and have not, within the three-year period preceding the proposal, been convicted of or had a civil judgment rendered against it:

   (a) For the commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public transaction (federal, state, or local) or a procurement contract under such a public transaction;

   (b) For the violation of federal or state antitrust statutes, including those proscribing price fixing between competitors, the allocation of customers between competitors, or bid rigging; or

   (c) For the commission of embezzlement, theft, forgery, bribery, falsification, or destruction of records, making false statements, or receiving stolen property.

I understand that a false statement on this certification may be grounds for the rejection of this proposal or the termination of the award. In addition, under 18 U.S.C. §1001, a false statement may result in a fine of up to $10,000 or imprisonment for up to five years, or both.

_____

Name and Title of Authorized Representative

_____

Name of Participant Agency or Firm

_____

Signature of Authorized Representative Date

☐ I am unable to certify to the above statement. Attached is my explanation.

Applicability

The Project or Program to which the construction work covered by this contract pertains is being assisted by the United States of America and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance.

A. 1. (i) Minimum Wages. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section I(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period.

Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible, place where it can be easily seen by the workers.

(ii) (a) Any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(b) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB control number 1215-0140.)

(c) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

(d) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii)(b) or (c) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part

of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

2. Withholding. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work, all or part of the wages required by the contract, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the contractor, disburse such amounts withheld for and on account of the contractor or subcontractor to the respective employees to whom they are due. The Comptroller General shall make such disbursements in the case of direct Davis-Bacon Act contracts.

3. (i) Payrolls and basic records. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section l(b)(2)(B) of the Davis-bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5 (a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section l(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and Budget under OMB Control Numbers 1215-0140 and 1215-0017.)

(ii) (a) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i) except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this subparagraph for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to HUD or its designee. (Approved by the Office of Management and Budget under OMB Control Number 1215-0149.)

(b) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under 29 CFR 5.5 (a)(3)(ii), the appropriate information is being maintained under 29 CFR 5.5(a)(3)(i), and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(c) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph A.3.(ii)(b).

(d) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under subparagraph A.3.(i) available for inspection, copying, or transcription by authorized representatives of HUD or its designee or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the contractor, sponsor, applicant or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and Trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant ',to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by

the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under 29 CFR Part 5 shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR Part 3 which are incorporated by reference in this contract

6. Subcontracts. The contractor or subcontractor will insert in any subcontracts the clauses contained in subparagraphs 1 through 11 in this paragraph A and such other clauses as HUD or its designee may by appropriate instructions require, and a copy of the applicable prevailing wage decision, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this paragraph.

7. Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act Requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.

10. (i) Certification of Eligibility. By entering into this contract the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001. Additionally, U.S. Criminal Code, Section 1 01 0, Title 18, U.S.C., "Federal Housing Administration transactions", provides in part: "Whoever, for the purpose of . . . influencing in any way the action of such Administration..... makes, utters or publishes any statement knowing the same to be false..... shall be fined not more than $5,000 or imprisoned not more than two years, or both."

11. Complaints, Proceedings, or Testimony by Employees. No laborer or mechanic to whom the wage, salary, or other labor standards provisions of this Contract are applicable shall be discharged or in any other manner discriminated against by the Contractor or any subcontractor because such employee has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable under this Contract to his employer.

B. Contract Work Hours and Safety Standards Act. The provisions of this paragraph B are applicable where the amount of the prime contract exceeds $100,000. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in subparagraph (1) of this paragraph, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph (1) of this paragraph, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by the clause set forth in sub paragraph (1) of this paragraph.

(3) Withholding for unpaid wages and liquidated damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contract, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same prime contractor such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subparagraph (2) of this paragraph.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph (1) through (4) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs (1) through (4) of this paragraph.

C. Health and Safety. The provisions of this paragraph C are applicable where the amount of the prime contract exceeds $100,000.

(1) No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.

(2) The Contractor shall comply with all regulations issued by the Secretary of Labor pursuant to Title 29 Part 1926 and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, (Public Law 91-54, 83 Stat 96). 40 USC 3701 et seq.

(3) The contractor shall include the provisions of this paragraph in every subcontract so that such provisions will be binding on each subcontractor. The contractor shall take such action with respect to any subcontractor as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.

U.S. Department of Labor
Wage and Hour Division

PAYROLL

(For Contractor's Optional Use; See Instructions at www.dol.gov/whd/forms/wh347instr.htm)

Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number.

U.S. Wage and Hour Division

Rev. Dec. 2008

OMB No.: 1235-0008
Expires: 02/28/2018

NAME OF CONTRACTOR ☐ OR SUBCONTRACTOR ☐	ADDRESS	
PAYROLL NO.	FOR WEEK ENDING	PROJECT AND LOCATION Service Line Investigation Project (Phase II) Redford Twp. Public Services

PROJECT OR CONTRACT NO.

(1) NAME AND INDIVIDUAL IDENTIFYING NUMBER (e.g., LAST FOUR DIGITS OF SOCIAL SECURITY NUMBER) OF WORKER	(2) NO. OF WITHHOLDING EXEMPTIONS	(3) WORK CLASSIFICATION	OT. OR ST.	(4) DAY AND DATE HOURS WORKED EACH DAY	(5) TOTAL HOURS	(6) RATE OF PAY	(7) GROSS AMOUNT EARNED	(8) DEDUCTIONS FICA	WITH-HOLDING TAX			OTHER	TOTAL DEDUCTIONS	(9) NET WAGES PAID FOR WEEK
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While completion of Form WH-347 is optional, it is mandatory for covered contractors and subcontractors performing work on Federally financed or assisted construction contracts to respond to the information collection contained in 29 C.F.R. §§ 3.3, 5.5(a). The Copeland Act (40 U.S.C. § 3145) contractors and subcontractors performing work on Federally financed or assisted construction contracts to "furnish weekly a statement with respect to the wages paid each employee during the preceding week." U.S. Department of Labor (DOL) regulations at 29 C.F.R. § 5.5(a)(3)(ii) require contractors to submit weekly a copy of all payrolls to the Federal agency contracting for or financing the construction project, accompanied by a signed "Statement of Compliance" indicating that the payrolls are correct and complete and that each laborer or mechanic has been paid not less than the proper Davis-Bacon prevailing wage rate for the work performed. DOL and federal contracting agencies receiving this information review the information to determine that employees have received legally required wages and fringe benefits.

Public Burden Statement

We estimate that is will take an average of 55 minutes to complete this collection, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. If you have any comments regarding these estimates or any other aspect of this collection, including suggestions for reducing this burden, send them to the Administrator, Wage and Hour Division, U.S. Department of Labor, Room S3502, 200 Constitution Avenue, N.W. Washington, D.C. 20210

(over)

Date _____

I, _____ _____
(Name of Signatory Party) (Title)

do hereby state:

(1) That I pay or supervise the payment of the persons employed by

_____ on the
(Contractor or Subcontractor)

_____; that during the payroll period commencing on the
(Building or Work)

_____ day of _____, _____, and ending the _____ day of _____, _____,

all persons employed on said project have been paid the full weekly wages earned, that no rebates have been or will be made either directly or indirectly to or on behalf of said

_____ from the full
(Contractor or Subcontractor)

weekly wages earned by any person and that no deductions have been made either directly or indirectly from the full wages earned by any person, other than permissible deductions as defined in Regulations, Part 3 (29 C.F.R. Subtitle A), issued by the Secretary of Labor under the Copeland Act, as amended (48 Stat. 948, 63 Stat. 108, 72 Stat. 967; 76 Stat. 357; 40 U.S.C. § 3145), and described below:

_____

_____

_____

_____

(2) That any payrolls otherwise under this contract required to be submitted for the above period are correct and complete; that the wage rates for laborers or mechanics contained therein are not less than the applicable wage rates contained in any wage determination incorporated into the contract; that the classifications set forth therein for each laborer or mechanic conform with the work he performed.

(3) That any apprentices employed in the above period are duly registered in a bona fide apprenticeship program registered with a State apprenticeship agency recognized by the Bureau of Apprenticeship and Training, United States Department of Labor, or if no such recognized agency exists in a State, are registered with the Bureau of Apprenticeship and Training, United States Department of Labor.

(4) That:

(a) WHERE FRINGE BENEFITS ARE PAID TO APPROVED PLANS, FUNDS, OR PROGRAMS

☐ – in addition to the basic hourly wage rates paid to each laborer or mechanic listed in the above referenced payroll, payments of fringe benefits as listed in the contract have been or will be made to appropriate programs for the benefit of such employees, except as noted in section 4(c) below.

(b) WHERE FRINGE BENEFITS ARE PAID IN CASH

☐ – Each laborer or mechanic listed in the above referenced payroll has been paid, as indicated on the payroll, an amount not less than the sum of the applicable basic hourly wage rate plus the amount of the required fringe benefits as listed in the contract, except as noted in section 4(c) below.

(c) EXCEPTIONS

EXCEPTION (CRAFT)	EXPLANATION

REMARKS:

NAME AND TITLE	SIGNATURE

THE WILLFUL FALSIFICATION OF ANY OF THE ABOVE STATEMENTS MAY SUBJECT THE CONTRACTOR OR SUBCONTRACTOR TO CIVIL OR CRIMINAL PROSECUTION. SEE SECTION 1001 OF TITLE 18 AND SECTION 231 OF TITLE 31 OF THE UNITED STATES CODE.

Record of Employee Interview

U.S. Department of Housing and Urban Development
Office of Labor Relations

OMB Approval No. 2501-0009
(exp.09/30/2017)

1a. Project Name	2a. Employee Name
1b. Project Number	2b. Employee Phone Number (including area code)
1c. Contractor or Subcontractor (Employer)	2c. Employee Home Address & Zip Code
	2d. Verification of identification? Yes ☐ No ☐

3a. How long on this job?	3b. Last date on this job before today?	3c. No. of hours last day on this job?	4a. Hourly rate of pay?	4b. Fringe Benefits?	4c. Pay stub?
				Vacation Yes ☐ No ☐ Medical Yes ☐ No ☐ Pension Yes ☐ No ☐	Yes ☐ No ☐

5. Your job classification(s) (list all) --- continue on a separate sheet if necessary

6. Your duties

7. Tools or equipment used

	Y	N		Y	N
8. Are you an apprentice or trainee?	☐	☐	10. Are you paid at least time and ½ for all hours worked in excess of 40 in a week?	☐	☐
9. Are you paid for all hours worked?	☐	☐	11. Have you ever been threatened or coerced into giving up any part of your pay?	☐	☐

12a. Employee Signature	12b. Date

13. Duties observed by the Interviewer (Please be specific.)

14. Remarks

15a. Interviewer name (please print)	15b. Signature of Interviewer	15c. Date of interview

Payroll Examination

16. Remarks

17a. **Signature of Payroll Examiner**	17b. **Date**

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 Charter Township of Redford, 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: DWSRF 2025 Water Main Replacement - Phase 14

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

This Project consists of: Replacement of approximately 5.5 miles of water main along various streets by pipe bursting. Related gate valves, hydrants, and fittings will be open cut. Directional drilling will occur beneath Joy Rd, Wadsworth St, Farley St, and the DPS Service Dr. as delineated in your Bid submitted to Charter Township of Redford on 06-26-2025.

Please comply with the following conditions within15 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 Owner when executed by them.

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

Within 10 days after you comply with those conditions, Owner will return to you 2 fully signed counterparts of the Agreement with the Contract Documents attached.

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

Owner: _____

Authorized Signature: _____

Copy to Wade Trim Associates, Inc.

SECTION 00 52 00
AGREEMENT

This Agreement, made and entered into this _____ day of _____ in the year 20___, by and between Charter Township of Redford hereinafter called Owner, 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:

Replacement of approximately 5.5 miles of water main along various streets by pipe bursting. Related gate valves, hydrants, and fittings will be open cut. Directional drilling will occur beneath Joy Rd, Wadsworth St, Farley St, and the DPS Service Dr.

The Work will be substantially completed on or before **10-21-2027**, and completed and ready for final payment in accordance with paragraph 14.11 of Section 00 72 00 - General Conditions on or before **11-20-2027**.

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

Charges will be made at such times and in such amounts as the Engineer will invoice the Owner, 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.

Owner and Contractor recognize that time is of the essence of this Agreement and that the Owner will suffer financial loss if the Work is not Substantially Complete within the time specified in paragraph 1.03.A above, plus any extensions thereof allowed in accordance with Article 12 of Section 00 72 00. They also recognize the delays, expense and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by the Owner if the Work is not Substantially Complete on time. Accordingly, instead of requiring any such proof, the Owner and the Contractor agree that as liquidated damages for delay (but not as penalty) the Contractor will pay the Owner $1,000.00 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.

Owner 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 Owner 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 Owner 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 Owner 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: DWSRF 2025 Water Main Replacement - Phase 14

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.

Owner and Contractor each binds them self, partners, successors, assigns and legal representatives to the other party hereto, their partners, successors, assigns and legal representatives in respect to all covenants, agreements and obligations contained in the Contract Documents.

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

IN WITNESS WHEREOF, the parties hereto have signed this Agreement in three counterparts. One counterpart each has been delivered to Owner and Contractor, and one counterpart has been delivered to the Engineer. The Contract Documents have been signed or identified by Owner and Contractor.

This Agreement will be effective on _____, 20____.

Owner: Charter Township of Redford

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: DWSRF 2025 Water Main Replacement - Phase 14

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.

Notify the Engineer**three (3)** full working days in advance of any staking requirements or other activity on the Project.

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

Owner: _____

Authorized Signature: _____

COPY TO Wade Trim Associates, Inc.

SECTION 00 60 00 - PROJECT FORMS

PART 1 GENERAL

1.01 AVAILABLE FORMS

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

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

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

CERTIFICATE OF SUBSTANTIAL COMPLETION

350.02

(Rev. 04/2020)

CLEAR FORM

WT Project No.:		**Project Name:**	
Owner / Municipality:			
Owner Project No.:		**Department:**	
Project Location:			
Contractor:		**Subcontractor:**	

Contract Date.: _____ Date of Issuance: _____

Project or Designated Portion Shall include:

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

DEFINITION OF DATE OF SUBSTANTIAL COMPLETION

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

A list of items to be completed or corrected, which has been prepared by ENGINEER, is attached hereto. The failure to include any items on such list does not alter the responsibility of 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 OWNER and CONTRACTOR for security, maintenance, heat, utilities, damage to the Work and insurance shall be as follows:

(Note - OWNER's and CONTRACTOR's legal and insurance counsel should determine and review insurance requirements and coverage; CONTRACTOR shall secure consent of surety company, if any.)

OWNER shall have 45 days after receipt of this certificate during which he 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's Signature Print Name Date

WADE TRIM

CLEAR FORM

CHANGE ORDER NO. _____

305.08
(Rev. 042020)

Prepared By: _____ **Date of Issuance:** _____

WT Project No.:		**Project Name:**	
Owner / Municipality:			
Owner Project No.:		**Department:**	
Project Location:			
Contractor:		**Subcontractor:**	

The Contract Documents are modified as follows upon execution of this Change Order:

Attachments: (List documents supporting change):

CHANGE IN CONTRACT PRICE

Original Contract Price:

$

Select 1 from previously approved Change Orders No. to No. :

$

Contract Price prior to this Change Order:

$

Select 1 of this Change Order:

$

Contract Price incorporating this Change Order:

$

CHANGE IN CONTRACT TIME

Original Contract Times:
☐ Working Days ☐ Calendar Days
Substantial Completion (date):
Ready for final payment (date):

Select 1 from previously approved Change Orders No. to No. :
Substantial Completion (days):
Ready for final payment (days):

Contract Times prior to this Change Order:
Substantial Completion (date):
Ready for final payment (date):

Select 1 of this Change Order:
Substantial Completion (days):
Ready for final payment (days):

Contract Times with all approved Change Orders:
Substantial Completion (date):
Ready for final payment (date):

RECOMMENDED:	ACCEPTED:	ACCEPTED:
By: _____ *Engineer (Authorized Signature)*	By: _____ *Owner (Authorized Signature)*	By: _____ *Contractor (Authorized Signature)*
Date: _____	Date: _____	Date: _____

Change Order becomes effective upon date of final signature.

WADE TRIM

CLEAR FORM

CHANGE PROPOSAL NO._____

305.01
(Rev. 04/2020)

Prepared By: _____ **Date of Issuance:** _____

WT Project No.:		**Project Name:**	
Owner / Municipality:			
Owner Project No.:		**Department:**	
Project Location:			
Contractor:		**Subcontractor:**	

This Change Proposal is submitted in accordance with Paragraph 10.06 of the 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**
Select 1 of this requested Proposal:	Select 1 of this requested Change Proposal:
$	Substantial Completion (days): Ready for final payment (days):

Engineer's Decision on Change Proposal:

ENGINEER:	OWNER:	CONTRACTOR:
By: _____ *Engineer (Authorized Signature)*	By: _____ *Owner (Authorized Signature)*	By: _____ *Contractor (Authorized Signature)*
Date: _____	Date: _____	Date: _____

WADE TRIM

CLEAR FORM

☐ CONSTRUCTION CHANGE REQUISITION
☐ WORK CHANGE DIRECTIVE

No. _____

305.05
(Rev. 04/2020)

Prepared By: _____

Date: _____
Page: ____ **of** ____

WT Project No.:		**Project Name:**	
Owner / Municipality:			
Owner Project No.:		**Department:**	
Project Location:			
Contractor:		**Subcontractor:**	

Description or Work:

Reason:

Item No.	Description	Unit	Quantity Increase (Decrease)	Unit Price	Amount Increase (Decrease)
					$ 0.00
					$ 0.00
					$ 0.00
					$ 0.00
					$ 0.00
					$ 0.00
					$ 0.00
					$ 0.00
				Net Cost	**$ 0.00**

Request for Contract Time Extension: ☐ Add _____ Days ☐ Not Applicable

Contractor (Representative)	Date	Wade Trim (Representative)	Date

WADE TRIM

☐ **CONSTRUCTION CHANGE REQUISITION**
☐ **WORK CHANGE DIRECTIVE**
No. _____
(continued)

Date: _____
Page: _____ of _____

Work Order Authorization: ☐ Approved ☐ Approved as Noted ☐ Not Approved

If authorized, the Contractor agrees to do the work outlined above under the direction of the Engineer, and to accept as payment in full the basis of payment as indicated.

Contract Time: ☐ Add Time Extension of _____ Days ☐ Not Applicable

Accepted By: _____ _____
Contractor (Representative) Date

Recommended By: _____ _____
Wade Trim (Representative) Date

Approved By: _____ _____
Owner (Representative) Date

WADE TRIM

CLEAR FORM

FIELD ORDER NO. _____

305.04
(Rev. 04/2020)
Page: 1 **of** _____

WT Project No.:		**Project Name:**	
Owner / Municipality:			
Owner Project No.:		**Department:**	
Project Location:			
Contractor:		**Subcontractor:**	

Date:	
Prepared by:	
Subject / Description:	

Classification:
- ☐ Clarification or ☐ Interpretation of Contract Documents
- ☐ Minor Change in Work (No Change in Contract Price and/or Time)
- ☐ Minor Change in Addition to Work (Requires Change in Contract Price and/or Time)

Reason:

Resident Project Representative Date

Contractor's Authorized Representative Date

NON-COMPLIANCE NOTICE / ORDER TO REMOVE DEFECTIVE WORK NO. _____

330.06
(Rev. 01/2018)

Job No.: _____ **Date:** _____

Project: _____ **Time:** _____

_____

Attention: _____

You are hereby notified that:

_____

does not conform to the Contract Requirements. The Specification violated in Section _____ , Article _____ , Drawing No. _____ . Under the provisions of the Contract, the requirements are _____

_____

_____

☐ Non-complying work may be required to be removed and replaced at no cost to the Owner.

☐ Non-complying work may be removed and replaced at no cost to the Owner. No work shall continue until the defective work has been removed.

It shall be the Contractor's responsibility to determine the corrective action plan necessary to bring the work into compliance. This action plan shall be submitted to the Owner and his authorized representative for their review and concurrence that said corrective action will adequately address the deficiency. If you refute the initial findings, it is your responsibility to make your position known to the Owner and his representative with sufficient documentation that your position can be evaluated. All actions described above shall be done in writing as near to the date of the Notice as possible, but no later then ten (10) days after the issuance of said Notice.

_____
Resident Project Representative (Signature)

Non-Compliance Notice Received By Contractor

Received On: _____ By: _____
Date (Signature)

Title: _____

Corrective action to be taken by Contractor: _____

_____

_____

_____ By: _____
Date (Signature)

Owner's Acknowlegement

☐ Accepted ☐ Accepted as Noted ☐ Unacceptable ☐ Pricing

_____

_____

_____ By: _____
Date (Signature)

OPEN ITEMS LIST

350.01
(Rev. 01/2019)

Page: _____ of _____
Construction Start Date: _____

WT Project No.:		**Project Name:**	
Owner / Municipality:			
Owner Project No.:		**Department:**	
Project Location:			
Contractor:		**Subcontractor:**	

Item No.	Description of Item	Initials	Date	Actions to be Taken to Close	Verified by Initials	Verified by Date

Close out of all items verified by Field Engineer: _____ **Signature:** _____ **Date:** _____

Comments:

1) This Open Items List is to be immediately inserted in the Inspection folder for each assignment by the assigned Inspector or the assigned Field Engineer.
2) Anyone can make entries on this list, but each entry must be initialed and dated. Items(s) entered must be reported to the assigned Field Engineer immediately.
3) Action to be taken should be confirmed with the assigned Field Engineer.
4) Verification for completion can be initialed and dated by the assigned Inspector but must also be verified by the assigned Field Engineer.
5) This form is not contractrual to contract completion.

CLEAR FORM

REQUEST FOR FINAL INSPECTION

350.06
(Rev. 04/2020)

CLEAR FORM

WT Project No.:		**Project Name:**	
Owner / Municipality:			
Owner Project No.:		**Department:**	
Project Location:			
Contractor:		**Subcontractor:**	

The project to which this request applies has been inspected by authorized representatives of CONTRACTOR and ENGINEER, and the Work is hereby declared to be substantially complete to a point that a project punch list should be prepared in accordance with the following schedule:

Develop Preliminary Punch List **Date:** _____

Responsibility: Owner, Contractor and Engineer
Engineer shall have 2 weeks to prepare the punch list.

Complete Preliminary Punch List Items **Date:** _____

Responsibility: Contractor
Contractor shall have 2 weeks to complete the items on the punch list.

Develop Final Punch List (if needed) **Date:** _____

Responsibility: Owner, Contractor and Engineer
If needed, a second and final punch list will be prepared within 2 weeks by Engineer.

Complete Final Punch List Items **Date:** _____

Responsibility: Contractor
Contractor shall have 2 weeks to complete the items on the second and final punch list.

Process Final Payment **Date:** _____

Engineer will have 2 weeks to review and submit final pay request documents from Contractor to the Owner for final payment upon satisfactory completion of punch list items by Contractor.

This notice signed and dated through mutual agreement of CONTRACTOR and ENGINEER will initiate the time sequence for the approved execution of finalizing _____

Contract in _____, Michigan, dated _____.

COPY: OWNER

Date: _____

_____
ENGINEER's Representative

Date: _____

_____
CONTRACTOR's Representative

[Contractor to Insert logo here]

REQUEST FOR INFORMATION (RFI) NO. _____

311-01
(Rev. 04/2020)

CLEAR FORM

Page: 1 of _____

WT Project No.:		**Project Name:**	
Owner / Municipality:			
Owner Project No.:		**Department:**	
Project Location:			
Contractor:		**Subcontractor:**	

RFI Subject:			
Division:		**Spec Section:**	
Plan Sheet No(s).:			
Date Received:		**Requested Response Date:**	
Returned to Contractor:			

Is there potential for impacting Contract Price and/or Schedule?

Contract Price Impact: Select 1 Contract Schedule Impact: Select 1

Information Requested

Attachments

WADE TRIM

RFI NO. _____

Response

Attachments

Response by: _____ **Date:** _____

THIS REPLY IS GIVEN WITH THE EXPRESSED UNDERSTANDING THAT IT DOES NOT CONSTITUTE BASIS FOR CHANGE IN PRICE OR TIME OF THE CONTRACT UNLESS OTHERWISE INDICATED.

CLEAR FORM

SUBSTITUTION REQUEST FORM

310.06
(Rev. 04/2019)

WT Project No.:		**Project Name:**	
Owner / Municipality:			
Owner Project No.:		**Department:**	
Project Location:			
Contractor:		**Subcontractor:**	

Specification Section: _____ Article No.: _____

Specified Product: _____

Proposed Substitution: _____

Does specified product exceed in any respect, proposed substitution?	○ Yes	○ No
Does substitution affect dimensions shown on Plans?	○ Yes	○ No
Does substitution affect other trades more than original product?	○ Yes	○ No
Does warranty differ from that specified?	○ Yes	○ No
Does substitution affect cost to OWNER?	○ Yes	○ No
Does substitution result in any license fee or royalty?	○ Yes	○ No

If you indicated "Yes" to any of the items above, attach thorough explanation for the following:

1. Explain any differences between proposed substitution and specified product.
2. Summarize experience with product and manufacturer in Project area.
3. 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: _____ Date Submitted: _____

Company: _____

Address: _____

Telephone: _____ Email: _____

Signature: _____

ACTION STATUS

ENGINEER'S REVIEW	RESPONSE REQUIRED OF CONTRACTOR
1. Approved (A) ☐	None ☐
2. Approved as Noted (AN) ☐	Confirm ☐
3. Revise and Resubmit (RR) ☐	Resubmit ☐
4. Not Approved - See Remarks (NA) ☐	

Engineer's review is for general conformance with the design concept and contract documents. Markings or comments should not be construed as relieving the contractor from compliance with the project requirements, nor departures therefrom. The contractor remains responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for selecting fabrication processes, for techniques of assembly, and for performing his work in a safe manner.

WADE TRIM
(XXX) XXX-XXXX

XXXXXXX
City, State ZIP

By:_____ Date:_____

WARRANTY DATA SHEET

350.07
(Rev. 04/2020)

CLEAR FORM

Date: _____
Page: ____ **of** ____

WT Project No.:		**Project Name:**	
Owner / Municipality:			
Owner Project No.:		**Department:**	
Project Location:			
Contractor:		**Subcontractor:**	
Contractor Address:		**Phone:**	

Project Description:

Supplier/Vendor: _____ Phone: _____
Address: _____

Manufacturer: _____ Serial No. _____
Manufacturer Part No.: _____ Asset / Part Name: _____

Location: _____ Owner ID No.: _____

Warranty Provider: _____

Warranty Type (labor, parts, parts and labor, etc.) _____

Warranty Description:

Warranty Class/Limitations: ☐ Limited ☐ 1 year ☐ 2 year
☐ Other: _____

Warranty Date: _____ Initial Reading: _____

Warranty Expiration Date: _____ Maximum Reading: _____

Exclusions:

Comments:

Attachment: Copy of Warranty

SECTION 00 61 12.13
LABOR AND MATERIAL PAYMENT BOND FORM

Bond No. _____

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

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

_____.

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

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

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

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

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

Signed and sealed this day of _____, 20_____.

Signed, sealed and delivered in the presence of:

Witness for Contractor: _____

_____ (Principal)

_____ (Title)

By: _____

Witness for Surety: _____

_____ (Surety)

_____ (Title)

By: _____

_____ (Attorney-in-Fact) Seal

Address of Surety: _____

Telephone: _____

SECTION 00 61 13.13
PERFORMANCE BOND FORM

Bond No. _____

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

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

_____.

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

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

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

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

Signed and sealed this day of _____, 20_____.

Signed, sealed and delivered in the presence of:

Witness for Contractor: _____

_____ (Principal)

_____ (Title)

By: _____

Witness for Surety: _____

_____ (Surety)

_____ (Title)

By: _____

_____ (Attorney-in-Fact) Seal

Address of Surety: _____

Telephone: _____ -

SECTION 00 61 19.13
MAINTENANCE AND GUARANTEE BOND FORM

Bond No. _____

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

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

_____

_____

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

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

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

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

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

Signed, sealed and delivered in the presence of:

Witness for Contractor: _____

_____ (Principal)

_____ (Title)

By: _____

Witness for Surety: _____

_____ (Surety)

_____ (Title)

By: _____

_____ (Attorney-in-Fact) Seal

Address of Surety: _____

Telephone: _____

SECTION 00 62 75
ENGINEER'S CERTIFICATE FOR PAYMENT

Job Number: _____ Certificate Number: _____ Date: _____

Owner: _____ Contractor: _____

Project: _____

Contract Date: _____

Substantial Completion: _____ Extended To: _____

Final Completion: _____ Extended To: _____

****

Original Contract Price: _____ Total Earned To Date: _____

Adjustments to Quantities: _____ Retention: _____

Extras: _____ Deductions: _____

Total Change Orders: _____ Total Withheld: _____

Amended Contract Price: _____ Total Net Due: _____

Less Total Net Due: _____ Less Previous Certificates: _____

Balance on Contract: _____ Balance Due This Certificate: _____

****

ENGINEER'S CERTIFICATE FOR PAYMENT

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

Certified By: _____ Date: _____

SECTION 00 62 76
CONTRACTOR'S APPLICATION FOR PAYMENT

Job Number: _____ Application No: _____ Date: _____

Owner: _____ Contractor: _____

Project: _____

Contract Date: _____

Period of this Application: _____ to _____ _____ _____

****

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

Previous Certificate: _____ Total Earned this Application: _____

CONTRACTOR'S CERTIFICATION

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

By: _____ Title: _____

CONTRACTOR'S DECLARATION

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

By: _____ Title: _____

SECTION 00 65 20
SWORN STATEMENT

State of Michigan

County of _____}

being duly sworn, deposes and says:

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

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

(Some columns are not applicable to all persons listed)

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

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

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

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

_____ day of _____, 20____.

Notary Public: _____

_____ County, Michigan

My Commission Expires: _____

INSTRUCTIONS

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

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

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

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

SECTION 00 72 00 - GENERAL CONDITIONS

ARTICLE 1 DEFINITIONS

1.01 DEFINED TERMS

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

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

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

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

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

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

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

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

8. Change Proposal -- A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by 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 Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by 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 Owner, 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 Owner 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 Owner and Contractor concerning the Work.

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

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

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

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

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

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

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

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

18. Defective -- An adjective which when modifying the word Work refers to Work that is unsatisfactory, faulty or deficient, in that it does not conform to the Contract Documents or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or has been damaged prior to 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 Owner to prepare Plans and Specifications for the Project and to assist Owner in interpreting Plans and Specifications during the performance of the Work. Engineer’s authority and responsibility are set forth in the Contract between Owner and Engineer. Contractor acknowledges and agrees that Engineer’s obligations and duties under Engineer’s contract with Owner are obligations and duties to Owner 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 Owner pays a single stipulate price (Lump Sum) for the entire scope of Work; plus or minus alternates and/or allowances. However, unit prices may be required for individual items of Work for the purposes of changes, additions, or deletions.

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

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

30. Notice to Proceed -- A written notice given by Owner to Contractor (with a copy to 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. Owner -- The public body or authority, corporation, limited liability company, association, partnership, or individual with whom Contractor has entered into the Agreement and for whom the Work is to be provided and as identified in the Supplementary Instructions to Bidders.

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

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

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

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

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

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

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

39. Resident Project Representative -- The authorized representative of 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 Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.

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

    a. Project Specifications are those portions of the Contract Documents which have been prepared specifically for this Project and which are identified by the job number in the lower right-hand corner of each page.

    b. Standard Specifications are Specification sections that are the same from Project to Project as of the revision date shown in the lower left-hand corner of the page.

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; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers' instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.

48. Substantial Completion -- The Work (or a specified part thereof) has progressed to the point where, in the opinion of 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 Owner, to furnish materials or equipment to be incorporated in the Work by Contractor or any Subcontractor.

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

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

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

55. Work Change Directive -- A written directive to Contractor, issued on or after the Effective Date of the Agreement and signed by Owner and reviewed by 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 Owner, Contractor will also deliver to Owner such Bonds and Insurance Certificates and other evidence of Insurance requested as Contractor may be required to furnish in accordance with Article 5. No Work at the site may begin or progress payments made to Contractor until all Bonds and Insurance Certificates in the form and substance required in Article 5 have been submitted and approved by Owner.

2.02 COPIES OF DOCUMENTS

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

2.03 COMMENCEMENT OF CONTRACT TIME; NOTICE TO PROCEED

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

2.04 STARTING THE PROJECT

A. Contractor will start to perform the Work within 10 days of when the Contract Time commences to run, but no Work shall 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, Owner, 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 Owner, 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 Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

G. Nothing in the Contract Documents creates:

1. any contractual relationship between Owner or 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 Owner 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 shall be effective to change the duties and responsibilities of Owner, Contractor or Engineer, or any of their Subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall it be effective to assign to Owner, 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 shall 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 shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor should reasonably have discovered and shall 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 shall report it to Engineer in writing at once, and, Contractor shall 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 Owner. However, Contractor shall not be liable to Owner 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 shall take precedence in resolving any conflict, error, ambiguity or discrepancy between the provisions of the Contract Documents and;

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

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

3.04 REQUIREMENTS OF CONTRACT DOCUMENTS

A. During the performance of the Work and until final payment, Contractor and Owner shall 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 Owner, unless it appeals by filing a Claim.

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

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

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

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

3.05 ORDER OF PRECEDENCE

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

1. figured dimensions shall govern over scaled dimensions;

2. Plans shall govern over Standard Specifications;

3. and Project Specifications shall govern over Standard Specifications 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 Owner:

1. shall 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 shall not reuse any of such Plans, Specification, other documents or copies on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.

3.08 ELECTRONIC DATA

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

B. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

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

4.01 AVAILABILITY OF LANDS

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

4.02 SUBSURFACE AND PHYSICAL CONDITIONS; INVESTIGATIONS AND REPORTS

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

B. The locations of utilities or other physical conditions relating to existing surface or subsurface structures at or contiguous to the Site as shown on the Plans are taken from drawings from sources believed to be reliable. Neither Owner nor 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 shall draw its own conclusions as to the general accuracy of the "technical data" contained in such reports and drawings, and confirms such reports and drawings are not Contract Documents. Contractor may not rely upon or make any Claim against Owner, 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 shall 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 shall immediately notify Owner 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 Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in paragraph 4.03.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. Owner's Statement to Contractor Regarding Site Condition. After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall 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 shall 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 shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:

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

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

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

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

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

4.04 UTILITIES

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

1. Owner 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 shall have full responsibility for:

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

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

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

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

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

further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by paragraph 6.18), identify the owner of such Underground Facility and give written notice to that owner and to Owner and 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 Owner regarding Contractor's resumption of Work in connection with the Utilities in question;
5. determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Utilities;
6. and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

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

E. Owner's Statement to Contractor Regarding Utilities. After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall 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 shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Utilities at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
    a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Utilities in question;
    b. With respect to Work that is paid for on a Unit Price basis, any adjustment in Contract Price will be subject to the provisions of paragraph 12.03;
    c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and
    d. Contractor gave the notice required in paragraph 4.04.B.

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

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

4.05 REFERENCE POINTS

A. Owner shall 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 shall be responsible for the preservation of established reference points and shall make no changes or relocations without the prior written approval of Owner. Contractor shall 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 Owner at the expense of Contractor. Construction Staking will be furnished by Owner as provided in Division 01 of the Specifications.

4.06 CONSTITUENTS OF CONCERN

A. Owner shall be responsible for any Constituents of Concern uncovered or revealed at the Site which was not shown or indicated in Plans or Specifications or identified in the Contract Documents to be within the scope of the Work and which may present a substantial danger to persons or property exposed thereto in connection with the Work at the Site. Owner shall 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 shall immediately:

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

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

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

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

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

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

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

F. To the fullest extent permitted by Laws and Regulations, Owner shall 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 shall obligate Owner to indemnify any person or entity from and against the consequences of that person's or entity's own negligence.

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

ARTICLE 5 BONDS AND INSURANCE

5.01 PERFORMANCE AND OTHER BONDS

A. Contractor shall 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 shall 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 shall also furnish such other Bonds as are required by the Supplementary Conditions.

B. All Bonds shall 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. All 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 shall

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

5.02 LICENSED INSURERS AND SURETIES

A. Bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall 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 shall purchase and maintain during the term of the Project such insurance as will protect him, Owner(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 Owner 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 shall 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 shall be written by the same insurance carrier, though not necessarily in one policy.

4. Contractor shall purchase for Owner an Owner's Protective Liability policy to protect Owner, 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 shall purchase a Builder's Risk Installation Floater in a form acceptable to Owner covering property of the Project for the full cost of replacement as of the time of any loss which shall include, as named insureds,

    a. Contractor,

    b. all Subcontractors,

    c. all Sub subcontractors,

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

6. Umbrella or Excess Liability:

    a. Contractor is granted the option of arranging coverage under a single policy for the full limit required or by a combination of underlying policies with the balance provided by an Excess or Umbrella Liability policy equal to the total limit(s) requested. Umbrella or Excess policy wording shall be at least as broad as the primary or underlying policy(ies) and shall apply both to Contractor's General Liability and Automobile Liability Insurance and shall 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 shall 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 shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall 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 shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.

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

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

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

5.04 LIMITS OF LIABILITY

A. The required limits of liability for insurance coverages required in paragraphs 5.03 shall 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 shall be given to Owner 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 shall furnish to Owner 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 Owner and Engineer.

B. Prior to the commencement of the Work, Contractor shall furnish to Owner complete "originally signed" copies of the Owner's Protective Liability Policy. The number of copies shall be the same as the number of counterparts of the Agreement. Owner reserves the right to request complete copies of other policies if deemed necessary to ascertain details of coverage not provided by the certificates. Such policy copies shall 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 shall be licensed or approved by the Insurance Bureau of the state in which the Project is located and shall have a financial rating not lower than XI and a policyholder's service rating no lower than B+ as listed in A.M. Best's Key Rating Guide, current edition. Companies with ratings lower than B+:XI will be acceptable only upon written consent of Owner.

5.08 DAMAGE CLAIMS - ACKNOWLEDGMENT AND REPORTS

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

B. Upon request, Contractor or Contractor's insurance carrier shall also furnish to Owner a status report on all damage claims. This report shall 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 shall be reimbursed in the monthly pay estimate following compliance with this paragraph.

5.09 COST OF INSURANCE

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

5.10 WAIVER OF RIGHTS

A. Owner and Contractor intend that all policies purchased in accordance with paragraph 5.03 will protect Owner, Contractor, Subcontractors, 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 shall contain provisions to

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

C. Owner and Contractor waive all rights against each other and their respective officers, directors, employees and agents for all losses and damages caused by, arising out of or resulting from any of the perils covered by such policies and any other property insurance applicable to the Work; and in addition, waive all such rights against Subcontractors, 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 shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.

5.11 RECEIPT AND APPLICATION OF INSURANCE PROCEEDS

A. Any insured loss under the policies of insurance required by paragraph 5.03.A.5 will be adjusted with Owner and made payable to Owner as fiduciary for the insureds, as their

interests may appear, subject to the requirements of any applicable mortgage clause. If no other special agreement is reached the damaged Work shall be repaired or replaced, the monies so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order, Field Oder or Work Change Directive.

B. Owner as fiduciary shall 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 shall object in writing within fifteen days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers.

ARTICLE 6 CONTRACTOR'S RESPONSIBILITIES

6.01 SUPERVISION AND SUPERINTENDENCE

A. Contractor shall 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 shall be solely responsible for the means, methods, techniques, sequences and procedures of construction. Contractor shall 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 shall 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 shall assign and maintain a competent superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances. Any superintendent or foreman who neglects to have Work done in accordance with the Plans and Specifications shall be removed from the Project. The superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communications given to the superintendent shall be as binding as if given to Contractor.

6.02 LABOR AND WORKING HOURS

A. Contractor shall provide competent, suitably qualified personnel in their various duties. Contractor shall 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 shall be performed during regular working hours (7:00 a.m. to 7:00 p.m.), and Contractor will not permit the performance of Work on Sunday or any legal holiday without Owner's written consent given after prior written notice to Engineer.

6.03 SERVICES, MATERIALS AND EQUIPMENT

A. Unless otherwise specified in the Contract Documents, Contractor shall 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 shall 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 shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall 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 shall 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, shall be plainly marked and removed immediately from the Work.

C. All materials and equipment shall 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 shall 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 shall 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 Owner for work on the Project) to adapt the design to the proposed substitute, and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty.

D. All variations of the proposed substitute from that specified shall be identified in the application and available maintenance, repair and replacement service shall be indicated. The application shall 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 shall 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 shall be final and binding, may not be reversed through an appeal under any provisions of the Contract Documents, and no "or-equal" or substitute shall be ordered, installed or utilized without Engineer's prior written acceptance. Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any "or-equal" or substitute which has been approved by 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 shall reimburse Owner 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 shall not employ any Subcontractor, Supplier or other person or organizations, including those who are to furnish the principal items of materials or equipment, whether initially or as a substitute, against whom Owner or Engineer may have reasonable objection. Contractor shall 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 Owner or Engineer shall not constitute a waiver of any right of Owner or Engineer to reject defective Work.

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

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

D. Contractor shall 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 shall create for the benefit of any such Subcontractor, Supplier of other person or organization any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other person or organization, nor shall it create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any Subcontractor, Supplier or other person or organization. Owner 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 shall 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 shall 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, Owner may require Subcontractor to furnish, for the benefit of Owner and Contractor jointly, Bonds in an amount proportioned to the amount of Subcontractor's subcontract, and for the same purpose and under the same specifications as those of the general Contract. The Surety on the general Contract shall not be eligible to furnish such Subcontract Bonds.

G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and 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 Owner, 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 shall file a true copy of such agreement with Owner.

6.06 PATENT FEES AND ROYALTIES

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process,

product or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of Owner or 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 shall be disclosed by Owner in Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Contractor shall defend, indemnify and hold harmless Owner 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 shall defend all such claims in connection with any alleged infringement of such rights.

6.07 PERMITS AND LICENSES

A. Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall 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 shall pay all charges of utility owners for connections to the Work.

6.08 LAWS AND REGULATIONS

A. Contractor shall give all notices and comply with all laws, ordinances, rules, and regulations applicable to furnishing and performance of the Work. Neither Owner nor Engineer shall 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 shall bear all claims, costs, losses, damages and expenses caused by, arising out of, or resulting therefrom. However, it shall 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 shall not relieve Contractor of Contractor’s obligations under paragraph 3.03.

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

6.09 TAXES

A. Contractor shall 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 shall 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 shall not unreasonably encumber the premises with construction equipment or other materials or equipment. Contractor shall 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 shall 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 shall be applicable to any claim hereunder.

6.11 REMOVAL OF DEBRIS AND CLEANING

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

6.12 LOADING STRUCTURES

A. Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall 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 shall 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 shall cooperate to the fullest extent with the utility, and Contractor shall see that Contractor's operations interfere as little as possible with these operations, and Contractor shall assume the cost of any charge against Owner therefor. In cases where existing Utilities or Utility service connections are encountered, Contractor shall perform Contractor's operations in such a manner that service will be uninterrupted, and the cost thereof shall be at Contractor's expense, unless otherwise provided.

6.14 RECORD DOCUMENTS

A. Contractor shall 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 shall be available to Engineer for examination and shall be delivered to Engineer for Owner upon completion of the Work.

6.15 SAFETY AND PROTECTION

A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of, and shall 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 shall 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 shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property, Utilities, and utility owners when prosecution of the Work may affect them.

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

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

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

F. Contractor shall inform Owner and Engineer of the specific requirements of Contractor’s safety program with which Owner’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 Owner and Contractor in accordance with paragraph 14.11 that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).

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

6.16 SAFETY REPRESENTATIVE

A. Contractor shall 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 shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.17 HAZARD COMMUNICATION PROGRAM

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

6.18 EMERGENCIES

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor, without special instruction or authorization from Owner or Engineer, is obligated to act to prevent threatened damage, injury or loss. Contractor shall 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 shall 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 shall 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 shall 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 shall 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 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.

D. At the time of each submission, Contractor shall 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 shall 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.

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

F. Contractor shall 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 shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.

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

6.21 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 shall be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and shall 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 shall 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 shall any concurrence by Engineer relieve Contractor from responsibility for errors or omissions in the Shop Drawings. Engineer's review shall 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 shall be commenced until the Submittal has been reviewed by Engineer.

6.22 CONTINUING THE WORK

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

6.23 CONTRACTOR'S GENERAL WARRANTY AND GUARANTEE

A. Contractor warrants and guarantees to Owner, 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 shall 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 Owner to Contractor under the Contract Documents;

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

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

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

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

8. any correction of defective Work by Owner.

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

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

E. The warranties provided in this section shall 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 shall indemnify, defend (with counsel acceptable to Owner) and hold harmless Owner, 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 shall include, but are not limited to:

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

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

3. All indemnification obligations imposed upon Owner or 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 shall not be construed to negate, abridge, or otherwise reduce any other right or obligations of indemnity which would otherwise exist.

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

F. The indemnification provisions under this Agreement shall 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 shall 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 shall 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 shall survive the termination of this Agreement.

I. Contractor and Subcontractors will compel their insurance company to waive subrogation against Owner, 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 shall not be required to provide professional services in violation of applicable Laws and Regulations.

B. If professional design services or certifications by a design professional related to systems, materials, equipment, structures, means, methods, techniques or sequences of construction are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall 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 shall 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, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall 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 shall not be responsible for the adequacy of the performance or design criteria specified by Owner 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, Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner’s employees, or through contracts between Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

B. If any part of Contractor's Work depends on proper execution or results upon the work of any such other contractor or utility owner, Contractor shall 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 shall 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 shall afford each contractor who is party to such a direct contract, and each utility owner, (and Owner, if Owner is performing the additional work with Owner’s employees), proper and safe access to the Site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work and shall properly connect and coordinate the Work with theirs. Unless otherwise provided in the Contract Documents, Contractor shall 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 shall 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 Owner was not noted in the Contract Documents, written notice thereof shall be given to Contractor prior to starting any such additional work. If Contractor believes that the performance of such additional work by Owner or others involves additional expense to Contractor, or requires an extension of the Contract Time, Contractor may make a Claim therefor as provided in paragraph 11.01. Claims for delay or inconveniences due to operations of such other parties for work noted in the Contract Documents will not be allowed.

ARTICLE 8 OWNER'S RESPONSIBILITIES

8.01 COMMUNICATION TO CONTRACTOR

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

8.02 REPLACEMENT OF ENGINEER

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

8.03 FURNISHING DATA

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

8.04 PAY WHEN DUE

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

8.05 LANDS AND EASEMENTS; REPORTS AND TESTS

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

8.06 CHANGE ORDERS

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

8.07 INSPECTIONS, TESTS, AND APPROVALS

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

8.08 LIMITATION ON OWNER’S RESPONSIBILITY

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

8.09 UNDISCLOSED HAZARDOUS MATERIALS

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

8.10 OWNER’S DESIGNATED REPRESENTATIVE

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

ARTICLE 9 ENGINEER'S STATUS DURING CONSTRUCTION

9.01 OWNER'S REPRESENTATIVE

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction shall 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 Owner, in general, if the Work is proceeding in accordance with the technical requirements of the Contract Documents. It will not be the responsibility of 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 Owner 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 shall in general be only with Engineer and Contractor, and dealings with Subcontractors shall 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 Owner, 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 Owner's liaison with Contractor when Contractor's operations affect Owner'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 shall 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 shall be binding on Owner, and also on Contractor who shall perform the change promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a request for a Change Proposal may be made therefore as provided in paragraph 10.06 or a Claim may be submitted as set forth in paragraph 11.01.

9.06 REJECTING DEFECTIVE WORK

A. 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 Owner 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, shall 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 Owner or Contractor believe that any such decision entitles them to an adjustment in the Contract Price, or Contract Times, or both, a Claim may be made under paragraph 11.01.

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

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

9.10 LIMITATIONS ON 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, shall give rise to any duty or responsibility of Engineer to Owner 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 shall 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 Owner, 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. Owner 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. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve;

1) the performance or acceptability of the Work,

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

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

2. Work Change Directives:

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

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

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

3. Field Orders:

a. 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 Owner and Contractor, which shall 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 shall submit a Change Proposal as provided herein.

10.02 OWNER-AUTHORIZED CHANGES IN THE WORK

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall 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 Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive.

B. Upon receipt of any such document, Contractor shall 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 shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph 10.02 shall 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 shall 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 shall comply with the provisions of paragraph 10.06. Any Claim for an adjustment of Contract Price shall 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 shall 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 shall be 15 percent;

b. for costs incurred under paragraph 12.01.B.3, Contractor's fee shall 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 shall be based on:

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

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

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

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

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

f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall 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 shall comply with the provisions of paragraph 10.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of paragraph 11.01.

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

10.06 CHANGE PROPOSALS

A. Contractor shall 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 shall 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 shall 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 shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any) to Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall 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 Owner 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 shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of 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 Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under paragraph 11.01.

B. Resolution of Certain Change Proposals: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then 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 shall be deemed a denial, and Contractor may choose to seek resolution under the terms of paragraph 11.01.

10.07 EXECUTION OF CHANGE ORDERS

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

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

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

3. changes in the Work which are:

a. ordered by Owner pursuant to paragraph 10.02,

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

c. agreed to by the parties, subject to the need for 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 Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this paragraph 10.07, it shall be deemed to be of full force and effect, as if fully executed.

10.08 NOTIFICATION TO SURETY

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

ARTICLE 11 CLAIMS

11.01 CLAIMS

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

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

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

3. Disputes that 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 shall 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 shall also furnish a copy to Engineer, for its information only. The responsibility to substantiate a Claim shall 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 shall 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 shall review it thoroughly, giving full consideration to its merits. The two parties shall 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 shall 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, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.

2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall 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 shall resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall 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 shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 16 for final resolution of disputes.

F. Denial of Claim: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall 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 shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

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

12.01 COST OF WORK

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

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

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall 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 shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall 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, shall be included in the above to the extent authorized by Owner.

2. Costs of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in

connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from Subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, 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 shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this paragraph 12.01.

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

5. Supplemental costs including the following:

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

    b. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall 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 shall be reasonable, but not more than 5 percent of the current list price, or invoice, of the equipment. The base hourly rate shall 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 shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall 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 shall 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 shall 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 shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner 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 Owner 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 shall 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 Owner 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 Owner may file a Claim, seeking and adjustment in the Contract Price if:

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

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

12.04 DELAYS IN CONTRACTOR'S PROGRESS

A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall 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 shall 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 shall be deemed to be within the control of Contractor.

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

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

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

3. acts of war or terrorism.

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

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

2. Contractor shall 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 shall 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 shall also furnish such additional supporting documentation as Owner 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 shall not be entitled to any adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.

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

K. Where Contractor is prevented from completing any part of the Work within the Contract Time (or Milestones) due to delay beyond the control of both Owner and Contractor, an extension of the Contract Times (or Milestones) in an amount equal to the time lost due to such delay shall be Contractor's sole and exclusive remedy for such delay. In no event shall Owner 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 Owner and Contractor, including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God, or acts of neglect by utility owners or other contractors performing other work;

L. Nor shall Owner 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 Owner or anyone for whom Owner is responsible. Except for an adjustment to the Contract Times and Contract Price, Contractor shall not be entitled to and hereby waives any and all damages that it may suffer by reason of such delay or for any Act of God, including but not limited lost profits, overhead, and other consequential damages.

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

13.01 ACCESS TO WORK

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

13.02 TESTS AND INSPECTIONS

A. Contractor shall 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 shall 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 shall assume full responsibility therefor, pay all costs in connection therewith and furnish Engineer the required certificates of inspection, testing or approval.

C. Contractor shall also be responsible for and shall pay all costs in connection with any inspection or testing required in connection with Owner'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 shall be paid by Owner unless otherwise specified.

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

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

G. Neither observations by Engineer nor inspections, tests or approvals by others shall 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 shall, if requested by Engineer, be uncovered by Contractor for Engineer's observation. Such uncovering shall 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, shall 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 shall be paid for as follows:

1. If it is found that such Work is defective, Contractor shall 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 shall be issued. If the parties are unable to agree as to the amount or extent of any change in Contract Price or Contract Time, Owner may make a Claim as provided in paragraph 11.01.

2. If, however, such Work is not found to be defective, Contractor shall 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, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 CORRECTION OR REMOVAL OF DEFECTIVE WORK

A. If required by Engineer or Owner, Contractor shall 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 shall 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 shall take no action that would void or otherwise impair Owner's special warranty or guarantee, if any, on such Work.

13.07 GUARANTEE PERIOD

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

1. repair defective land or areas;

2. correct such defective Work;

3. if the defective Work has been rejected by Owner, remove it from the Site and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work or the work of others or other land or areas resulting therefrom.

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

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

13.08 ACCEPTANCE OF DEFECTIVE WORK

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

13.09 OWNER MAY CORRECT DEFECTIVE WORK

A. If Contractor fails within a reasonable time after written notice from 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), Owner may, after 48 hours' written notice to Contractor and Contractor's Surety without prejudice to any other remedy Owner may have, correct and remedy any such deficiency.

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

C. All claims, costs, losses, damages and expenses incurred or sustained by Owner in exercising such rights and remedies shall be charged against Contractor and a Change Order shall be issued incorporating the necessary revisions in the Contract Documents with respect to the Work. Owner shall 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 shall not be allowed an extension of the Contract Time because of any delay in performance of the Work attributable to the exercise by Owner of Owner's rights under this Article 13.

ARTICLE 14 PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 SCHEDULES

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

B. The Schedule of Values shall include quantities and unit prices aggregating the Contract Price and shall subdivide the Work into component parts. Each unit cost so established shall 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 shall equal the total Contract Price established in the Proposal.

C. The Schedule of Values shall 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 shall become part of the Agreement and shall 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\ shall 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 shall 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 Owner may reasonably require. The Payment Schedule shall be on the form provided in the Contract Documents or in a format acceptable to Engineer or Owner. On the second and all subsequent payments, partial Waivers of Lien and Sworn Statement shall 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 shall also be accompanied by such data, satisfactory to Owner, as will establish Owner's title to the material and equipment and protect Owner's interest therein, including applicable insurance. A receipted vendor's invoice showing the quantities of materials and the amounts paid will be required and shall 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 shall file with Owner the written consent of the Surety to such reduction and shall 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 shall 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 shall be 10%, or such an amount as Owner 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 Owner, 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 Owner, 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 Owner or entitle Owner 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 Owner 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 Owner. 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 Owner from loss because:

1. the Work is defective, or completed Work has been damaged requiring correction or replacement;

2. the Contract Price has been reduced because of Change Orders;

3. Owner has been required to correct defective Work in accordance with paragraph 1309, or has accepted defective Work in accordance with paragraph 13.08;

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

5. 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 Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of paragraph 14.05.B) become due, (or only if Owner is a public agency, within 15 days after Owner receives the funds which are to be provided by a department or agency of the federal or state government, whichever is later, or in accordance with any time periods required by any applicable statute, rule or regulation) and when due will be paid by Owner to Contractor.

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

1. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries,

2. adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

3. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

4. Contractor has failed to provide and maintain required bonds or insurance;

5. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

6. Owner has incurred extra charges or engineering costs related to Submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;

7. The Work is defective, requiring correction or replacement;

8. Owner has been required to correct defective Work in accordance with paragraph 13.09, or has accepted defective Work pursuant to paragraph 13.08;

9. The Contract Price has been reduced by Change Orders;

10. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;

11. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;

12. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

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

14. Owner has actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.04.E.1 through 14.04.E.5.

C. If Owner refuses to make payment of the full amount recommended by Engineer, Owner 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. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor corrects, to Owner's satisfaction, the reasons for such action. The reduction imposed shall be binding on Contractor unless Contractor duly submits a Change Proposal contesting the reduction.

D. If it is subsequently determined that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by paragraph 14.05.

14.06 CONTRACTOR'S WARRANTY OF TITLE

A. Contractor warrants and guarantees that title to all Work, materials and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner at the time of payment free and clear of all Liens, claims, security interests and encumbrances (hereafter in these General Conditions referred to as "Liens").

14.07 SUBSTANTIAL COMPLETION

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a Certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall 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 Owner a preliminary Certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall 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 Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefore. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer

will, within said 14 days, execute and deliver to Owner and Contractor a final Certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary Certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

E. After Substantial Completion Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

14.08 PARTIAL UTILIZATION

A. Use by Owner of completed portions of the Work may be accomplished prior to Substantial Completion of all the Work subject to the following:

1. Owner at any time may request Contractor in writing to permit Owner to use any part of the Work which Owner believes to be substantially complete and which may be so used without significant interference with construction of the other parts of the Work. If Contractor agrees, Contractor will certify to Owner and 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 Owner, Contractor and Engineer shall 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 Owner 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 Owner and Contractor a certificate to that effect, fixing the date of Substantial Completion for that part of the Work, attaching thereto a punch list of items to be completed or corrected before final payment.

2. Prior to issuing a certificate of Substantial Completion for that part of the Work, Engineer will deliver to Owner and Contractor a written recommendation as to the division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, maintenance, utilities and insurance for that part of the Work, which shall become binding upon Owner and Contractor at the time of issuing the definitive certificate of Substantial Completion for that part of the Work unless Owner and Contractor shall have otherwise agreed in writing and so informed Engineer.

3. Owner shall have the right to exclude Contractor from any part of the Work which Engineer has so certified to be substantially complete, but Owner shall allow Contractor reasonable access to complete or correct items on the punch list.

4. In lieu of the issuance of a certificate of Substantial Completion as to part of the Work, Owner may take over operation of a facility constituting part of the Work whether or not it is Substantially Complete if such facility is functionally and separately usable; provided that prior to any such takeover, Owner and Contractor have agreed as to the division of responsibilities between Owner and Contractor for security, operation, safety, maintenance, correction period, heat, utilities and insurance with respect to such facility.

14.09 FINAL INSPECTION

A. Upon written notice from Contractor that the Work is complete, Engineer will make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall 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 shall 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 Owner, of all Liens arising out of or filed in connection with the Work.

C. In lieu of the releases or waivers of Lien, if approved by Owner, Contractor may furnish receipts or releases in full; an affidavit of Contractor that the releases and receipts include all labor, services, material and equipment for which a Lien could be filed, and that all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner or Owner's property might in any way be responsible, have been paid or otherwise satisfied.

D. If any Subcontractor, manufacturer, fabricator, Supplier or distributor fails to furnish a release or receipt in full, Contractor may furnish a Bond or other collateral satisfactory to Owner to indemnify Owner against any Claim or Lien.

14.11 FINAL PAYMENT AND ACCEPTANCE

A. If, on the basis of 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 Owner for payment. At that time Engineer will give written notice to Owner 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 shall make the necessary corrections and resubmit the Application.

C. If the Application and accompanying documentation are appropriate as to form and substance, Owner shall, 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 Owner claimed set-offs allowed under the Contract Documents, including but not limited to any applicable liquidated damages as determined by Owner. If Owner rejects the Application, Owner shall 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, Owner shall, 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 Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 5.01, the written consent of the Surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.13 WAIVER OF CLAIMS

A. The making and acceptance of final payment shall constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to paragraph 14.09, or from failure to comply with the Contract Documents or the terms of any special guarantees specified therein; and shall not constitute a waiver by Owner of any rights in respect of Contractor's existing or continuing obligations under the Contract Documents; and,

2. a waiver of all Claims by Contractor against Owner other than those previously made in writing and still pending in accordance with Article 16.

14.14 LATE PAYMENTS

A. All monies not paid when due hereunder, except monies involving Federal and/or State Loans, Grants, or other sources which are delinquent because of no fault of Owner, shall bear interest at the maximum rate allowed by law at the time and place of the Project.

ARTICLE 15 SUSPENSION OF WORK AND TERMINATION

15.01 OWNER MAY SUSPEND WORK

A. Owner may, at any time and without cause, suspend the Work or any portion thereof for a period as Owner may deem necessary by notice in writing to Contractor and Engineer. If it should become necessary to stop work for an indefinite period, Contractor shall store all materials in such manner that they will not become an obstruction, nor become damaged in any way, and Contractor shall take every precaution to prevent damage or deterioration of the Work performed; provide suitable drainage by opening ditches and drains, and erect temporary structures where necessary. Contractor may request an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension if Contractor makes a Claim therefor as provided in paragraph 11.01.

15.02 OWNER MAY TERMINATE FOR CAUSE

A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:

1. Contractor commences a voluntary case under any chapter of the Bankruptcy Code (Title 11, United States Code), as now or hereafter in effect, or if Contractor takes any equivalent or similar action by filing a petition or otherwise under any other federal or state law in effect at such time;

2. a petition is filed against Contractor under any chapter of the Bankruptcy Code as now or hereinafter in effect at the time of filing, or if a petition is filed seeking any such equivalent or similar relief against Contractor under any other federal or state law in effect at the time relating to bankruptcy or insolvency;

3. Contractor makes a general assignment for the benefit of creditors;

4. a trustee, receiver, custodian or agent of Contractor is appointed under applicable law or under contract, whose appointment or authority to take charge of property of Contractor is for the purpose of enforcing a Lien against such property or for the purpose of general administration of such property for the benefit of Contractor's creditors;

5. Contractor admits in writing an inability to pay its debts generally as they become due;

6. Contractor persistently fails to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under paragraph 2.05 as revised from time to time);

7. Contractor disregards Laws and Regulations of any public body having jurisdiction;

8. Contractor disregards the authority of Engineer or Owner; or,

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

B. Owner may, after giving Contractor (and the Surety, if there be one) 7 days' written notice, and to the extent permitted by Laws and Regulations, terminate the services of Contractor, exclude Contractor from the Site, take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the site and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion),

incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, finish the Work as Owner may deem expedient, and/or enforce the rights available to Owner under any applicable Performance Bond.

C. In such case, Contractor shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, damages and expenses sustained by Owner arising out of or resulting from completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, damages and expenses exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, damages and expenses incurred by Owner 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, Owner shall not be required to obtain the lowest price for the Work performed.

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

15.03 TERMINATION FOR CONVENIENCE

A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy, elect to terminate the Agreement. In such case, Contractor shall 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 shall 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 shall:

1. Immediately discontinue Work on the date and to the extent specified in the notice except to the extent necessary to protect Work in place;

2. Place no further orders for materials, services, or facilities, other than as may be necessary or required for completion of such portion of Work under the Contract that is not terminated;

3. Promptly make every reasonable effort to obtain cancellation upon terms reasonably satisfactory to Owner of all purchase orders and subcontracts to the extent they relate to the performance of Work terminated or assign to Owner those orders and subcontracts and revoke agreements specified in such notice;

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

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

6. Deliver to Owner an affidavit regarding the identity of potential unpaid Subcontractors or Suppliers and the amounts due to each.

15.04 CONTRACTOR MAY STOP WORK OR TERMINATE

A. If Owner has failed to pay Contractor any sum finally determined to be due in accordance with the time limits specified in paragraph 14.05, Contractor may upon 7 days' written notice to Owner and 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 Owner, or under an order of court or other public authority, then Contractor may, upon 7 days written notice to Owner and Engineer and provided Owner or Engineer does not remedy such suspension or failure within that time, terminate the Agreement and recover from Owner payment on the same terms as provided in paragraph 15.03.

C. The provisions of this paragraph 15.04 shall not relieve Contractor of Contractor's obligations under paragraph 6.22 to carry on the Work in accordance with the Progress Schedule and without delay during disputes and disagreements with Owner.

ARTICLE 16 FINAL RESOLUTION OF DISPUTES

16.01 METHODS AND PROCEDURES

A. Disputes Subject to Final Resolution: The following disputed matters are subject to final resolution under the provisions of this Article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and

2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents and arising after final payment has been made.

B. Final Resolution of Disputes: For any dispute subject to resolution under this Article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or

2. agree with the other party to submit the dispute to another dispute resolution process; or

3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, the following dispute resolution process shall be followed:

a. The parties shall 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 shall 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) shall be final and binding and is enforceable in a court of competent jurisdiction.

ARTICLE 17 MISCELLANEOUS

17.01 GIVING NOTICE

A. Whenever any provision of the Contract Documents requires the giving of written notice to Owner, Engineer, or Contractor, it shall 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 shall 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 shall 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 shall 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 shall 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 shall 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 shall 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 shall covenant and 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 shall be paid by Contractor to Owner prior to final payment authorization. However, Contractor shall not be charged with any post completion date engineering and inspection costs when the delay in completion of the Work is due to the following and Contractor has promptly given written notice of such delay to Owner or Engineer:

1. to any preference, priority or allocation order duly issued by Owner;

2. to unforeseeable causes beyond the control and without the fault or negligence of Contractor, including but not restricted to, acts of God, or of the public enemy, acts of Owner, acts of another contractor in the performance of a Contract with Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and abnormal and unforeseeable weather; and,

3. to any delays of Subcontractors or Suppliers occasioned by any of the causes specified in this Article.

B. Charges after the specified completion date shall be made at such times and in such amounts as Engineer shall invoice Owner, provided, however said charges shall be in accordance with Engineer's current rate schedule at the time the costs are incurred. Engineering and inspection costs so incurred shall be deducted from Contractor's progress payments.

17.07 WAIVER OF CONSEQUENTIAL DAMAGES

A. Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract or the Work. This mutual waiver includes but is not limited to:

1. damages incurred by Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

2. damages incurred by Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit in connection with any other project or anticipated project.

B. This mutual waiver is applicable, without limitation, to all consequential damages due to either party’s termination or default. Nothing contained in this Section shall 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 shall not constitute a waiver of that provision, nor shall 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 “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: None

2. Copies of the following reports and/or tests are attached as Exhibits: None

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 shall be responsible for the preservation of established reference points and shall make no changes or relocations without the prior written approval of Owner. Contractor shall 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 Owner at the expense of Contractor. Construction Staking will be furnished by Owner 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:

   Charter Township of Redford, Wade Trim Associates, Inc., and Wade Trim Associates, Inc. 's Subconsultant(s), 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: $500,000

   Disease – Policy Limit: $500,000

   Disease – Each Employee: $500,000

   SGC-5.04.B Comprehensive General Liability

   General Aggregate:

   Products – Com/Ops Aggregate: $3,000,000

   Personal and Advertising Injury: $1,000,000

   Each Occurrence: $3,000,000

   Fire Damage (any one fire): $500,000

   Medical Expense (any one person): $10,000

   SGC-5.04.C Comprehensive Automobile Liability

   Combined (bodily injury and property damage) single limit: $3,000,000

   SGC-5.04.D Owner's Protective - Coverage shall be Occurrence Form

   General Aggregate:$3,000,000

   Each Occurrence: $3,000,000

   SGC-5.04.E Builder's Risk-Installation Floater

   Cost to Replace at Time of Loss

SGC-5.04.F Umbrella or Excess Liability: $2,000,000

F. **SGC- 12.04 Lump Sum Work**

1. Add the following new paragraph after Article 12.03 of Section 00 72 00 - General Conditions, which is to read as follows:

12.04 LUMP SUM WORK

a. When additional work or deletion of work, which is covered by a lump sum item, is required due to a modification, not a normal overrun or underrun in estimated quantities, payment or credit for the work will be based upon apparent unit prices which will be derived by dividing the lump sum price by the estimated plan quantities.

b. Renumber subsequent paragraphs accordingly.

G. **SGC-18 Liquidated Damages**

1. Liquidated damages, if applicable, are referenced in the Proposal and Agreement. The requirements for liquidated damages should be included herein.

ARTICLE 18 LIQUIDATED DAMAGES

a. If the Contractor fails to Substantially Complete the Work within the Contract Time, or extension of time granted by the Owner, then the Contractor will pay to the Owner the amount for liquidated damages as specified in the Agreement for each calendar day that the Contractor will be in default after the time stipulated in the Contract Documents. The liquidated damages charged will be deducted from the Contractor's progress payments.

b. Contractor will not be charged with liquidated damages or any excess cost when the delay in Substantial Completion of the Work is due to the following and the Contractor has given written notice of such delay within seven (7) calendar days to Owner or Engineer.

c. To any preference, priority or allocation order duly issued by the Owner.

d. To unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to, acts of God, or of the public enemy, acts of the Owner, acts of another Contractor in the performance of a Contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and abnormal and unforeseeable weather; and

e. To any delays of subcontractors occasioned by any of the causes specified in paragraph "a" and "b" of this Article.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 11 00 - SUMMARY OF WORK

PART 1 GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

A. This project includes the following:

Replacement of approximately 5.5 miles of water main along various streets by pipe bursting. Related gate valves, hydrants, and fittings will be open cut. Directional drilling will occur beneath Joy Rd, Wadsworth St, Farley St, and the DPS Service Dr.

B. The Contractor shall sawcut all pavements full-depth at the nearest pavement joint in advance of removals. Sawcutting shall not be paid for separately and payment for sawcutting shall be included in payment for other pay items.

C. The Contractor shall provide written notice to all residences of driveway access interruption 72 hours in advance of all interruptions including, but not limited to, pavement removals and pavement replacement. All written notices require approval for distribution from the Engineer. The Contractor shall provide the Engineer with copies of notices 5 (five) working days in advance of their distribution for review and approval.

D. The Contractor shall schedule work, stage equipment and materials, and conduct operations in a manner which will provide access to all roadways, sidewalks, and driveways at all times whenever possible utilizing maintenance gravel.

E. The Contractor shall permit access to garbage, mail, and emergency vehicles and personnel to the work site at all times. Access shall be maintained and maintenance gravel shall be used so that garbage, mail, and emergency vehiciles have 24-hour unassisted access to the work site at all times.

F. The Contractor shall protect existing improvements such as decorative or street lighting systems, irrigation systems, sump pump outlets, landscaping, fences, and other similar improvements along the site of the Work. The Contractor shall repair or replace any damage to existing improvements at no additional cost to the Owner.

G. The Contractor shall notify the Engineer upon uncovering a sump pump outlet.

H. The Contractor shall not place seed or restore landscaping after May 15 and/or before September 2. Sod shall not be permitted as a substitute in lieu of seed.

I. No tree removal, trimming, or cutting may occur during the non-volant or pup season for the Indiana Bat, which is June 1 to July 31.

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. Lead/Galvanized Service Line Verification and Replacement Projects; dedicated projects for lead service line verification and replacement thoughout the Township.

B. Central CSO RTB and Collector Sewer; Construction of a Retention Treatment Basin, dewatering pump, pump station, and building facility located at Roosevelt Park 15120 Aubrey Street, Redford Township, MI 48239 and the surrounding Western Golf and Country Club is anticipated to last until Fall 2027.

C. Five Mile Bridge; Wayne County is replacing the 5 Mile Bridge over Bell Creek. This work is anticipated to begin in the late fall of 2025. 5 Mile Road at the bridge will be shut down during construction with detours to be posted by Wayne County.

D. Redford Community Center; construction of a new Recreational Center is under way at the northwest corner of Beech Daly Road and Graham Road and is anticipated to continue through 2025.

E. Due to the anticipated duration of construction for this Project, the Contractor is advised various road, water main and/or private development projects as well as various festivals and/or firework demonstrations (mid-June) may arise. Coordination will be required with the OWNER and the Engineer.

1.04 RIGHT-OF-WAY JURISDICTION/PERMITS

A. Telegraph and Plymouth Roads are under the jurisdiction of the Michigan Department of Transportation.

B. Other roads and streets in the vicinity of the Project are under the jurisdiction of the Wayne County Department of Public Services.

C. Bigelow, Campbell, Prindle, and Prindle and Branch Drains are under the jurisdiction of Waye County Drain Office.

D. Work in the Wayne County Department of Public Services right-of-way requires a permit from the Wayne County Department of Public Services. 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.

1. Cost of all inspection including any necessary soil compaction tests and concrete testing performed by Wayne County Department of Public Services on this Project will be deducted from the inspection deposit. A cash inspection deposit (along with the permit fee and the plan review fee) will be required to be paid by the Contractor prior to obtaining the permit.

2. Contractor is cautioned that the deposit is based upon the estimated cost. The actual cost of the inspection fee will be the actual costs incurred by Wayne County Department of Public Services for inspection on the Project. Contractor will be responsible for any additional costs over and above the fee calculated above and will be refunded any excess amounts.

E. Soil erosion and sedimentation control is under the jurisdiction of the Wayne County Department of Environment, Land Resource Management Division.

F. 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. The Contractor shall be made aware of all projects listed in Section 1.03 Work by Others of this document and shall exhaust all efforts to coordinate all work, including, but not limited to, pavement removal and replacement, utility disconnections and connections, traffic maintenance, hauling away of spoils, delivery of materials, staging of equipment, and all other relevant work activities with the corresponding municipality and their representatives to avoid interrupting utlity services and pedestrian and vehicular traffic and to maintain access to facilities at all times. Allowances and extensions of time shall not be approved for delays in scheduled contract work resulting from failure of the Contractor to coordinate with work by others.

B. The Contractor shall be required to coordinate with the Owner's sanitation service and to exhaust all efforts, including but not limited to taking trash cans and refuse to designated locations, to provide access to trash cans and other refuse for collection on the regularly scheduled days and times.

C. 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.

D. Whenever an existing gate valve must be opened or closed, the Redford Water Department will be notified. Valves will be opened or closed only by the Redford Water Department.

E. While both existing and new fire hydrants are in place, the Contractor will clearly mark those hydrants not in service and notify the Redford Fire Department of hydrants not in service.

F. 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 SERVICE LINE REPLACEMENT

A. Any temporary water services or mains, or any other method of construction necessary to comply with the requirement that water service may not be disrupted to any entity for more than 10 hours is incidental to the Project.

B. Work may need to be completed on Saturdays or off hours to accommodate residents. No additional compensation will be allowed for work completed on Saturdays or off hours.

C. For properties with lead service lines, provide written notice to each water customer explaining that they may experience increased lead levels in their drinking water along with guidance on measures consumers can take to minimize their exposure to lead at least 45 days in advance of beginning lead service line replacements at the water customer’s address.

D. Coordinate with each property owner for access to buildings and properties for the purpose of inspection, documentation, and replacement of water service lead material at the meter location for all water services. It is not anticipated that the Contractor will enter the home a second time for inspection of water service materials.

E. For properties with lead service lines, submit a Public Coordination Plan to the Township for approval prior to beginning any contact with the property owners. The Public Coordination Plan shall include, at a minimum, information pertaining to how initial and continued contact with property owners will occur, a contact email and phone number for property owners to reach at

all hours, and the scheduling and logistics plan for entering each building. Per EGLE guidelines, a minimum of 45 days of notice to the homeowner is required prior to performing any lead service lead replacement. Provide 72 hours of advance notice prior to any interuptions.

F. Submit a service line material documentation sheet for Owner approval prior to beginning work. Submit an updated inventory of completed water service line material documentation on a bi-weekly basis for Owner review.

G. Coordinate with property owner for scheduling Work inside of the house, as necessary. Contact property owner, review existing conditions inside the home, take photographs as necessary, document any existing damage in the home, summarize the Work as required for each connection, and make sketches as appropriate.

H. Reuse existing corporation stops and water service connections to the existing water main whenever possible. A service adapter will be required to adapt to the new copper water service line; this adapter is included in the cost of the water service pay item(s). When not possible to use the existing connection, a new connection will be paid for and the existing corporation stop will be turned off and plugged. The water service pay item, from the mainline to the property line, includes a tapped repair saddle, a corporation stop, and a tap to the water main.

I. Installation from Mainline to Curb Stop/Property Line

1. Replace all residential service lines that are less than 1 inch or not copper.
2. Furnish and install a new 1-inch K Copper water service from the mainline to the property line for the short side and long side of the street, as applicable.
3. Tap/reconnect main line and install corporation stop.

J. Lead Service Line Replacement: Installation from Curb Stop/Property Line to Meter

1. Furnish and install a new 1-inch K Copper water service from the curb stop and box at the property line, to the location of the existing water meter inside the home.
2. Sawcut and remove the existing floor to allow for the installation of the new water service into the home and to the existing meter.
3. Repair and completely seal the existing concrete floor with hydraulic cement to prevent water infiltration.
4. Do not drill through basement walls of the homes without prior written approval of the Owner.
5. Exercise caution to prevent damaging the existing foundation. Contractor is responsible for repairing any damage to the foundation caused by their installation operation.
6. Provide temporary grounding for the home’s electrical system during the installation of the new water service.
7. Identify the location of any existing utility services to the home and conduct operations in such a manner as to ensure new water service installation does not damage existing utilities. Contractor is responsible for repairing any damages to the satisfaction of the homeowner and utility company.

8. Contarctor is responsible for moving and restoring any items on the interior of the home that infringe upon the work.

9. Contractor is responsible for any modifications to the interior plumbing necessary to install new water service. Install a new interior water shut-off valve (angle meter ball valve with handle) Owner side of water meter.

10. There are no Owner permit fees for work under this Contract.

11. Restore water service to the home by the end of the working day. Under no circumstance will a homeowner be left without water for the night.

12. Contractor is responsible for removing any debris generated by the work on the interior and exterior of the building and for restoring all disturbed areas, including the area around the water service, as nearly as practicable to its original condition.

13. Restore all disturbed areas outside the home with 3-inches of topsoil and sod.

K. When connecting metal pipes of different metallurgical composition, a dielectric union is required.

L. Contractor is responsible for performing any repairs to the home due to damage caused during water service installation and for restoring the area back to its original condition.

M. Flush each system following water service replacement in accordance with AWWA C810 and shall not restore water services until all lead has been removed from the system.

1.07 LOCATING SANITARY SERVICES

A. Locate and obtain an elevation for each sanitary service within the influence of the proposed pipe.

B. Clean the mainline only as deemed necessary by Engineer in order to complete the pre and/or post television inspection.

1.08 CONTRACTOR'S USE OF PREMISES

A. Contractor will maintain construction operations within the presently existing road rights-of-way and easements throughout the Project area. In the event that the Contractor deems it necessary or advisable to operate beyond the limits of the existing rights-of-way or easements, Contractor will be responsible for making special written agreements with the property owners and will furnish such copies of agreement to the Owner.

1.09 PHOTOGRAPHS

A. Photographs as specified in Section 01 33 00 - Submittal Procedures will be required for this Project.

1.10 AUDIO/VIDEO ROUTE SURVEY

A. An audio/video route survey as specified in Section 01 33 00 - Submittal Procedures will be required for this Project. Complete coverage will include the project locations indicated on the drawings..

B. The audio/video route survey will be delivered on a USB Flash Drive.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 21 00 - ALLOWANCES

PART 1 GENERAL

1.01 GENERAL INFORMATION

A. Contractor will include Allowance(s) listed in the Bid Proposal that will cover work, manufactured equipment or services that will be provided either by Contractor or by others who may be selected by Owner.

B. Work performed under Allowances will be subject to Owner approval and under special terms described herein. Contractor will coordinate and cause the work covered by these Allowances.

C. It is understood that Contractor has included in the Contract Price Allowances so named in the Contract Documents and will cause the work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner.

1.02 REQUIREMENTS

A. Allowances will be administered in accordance with the provisions of the General Conditions of the Contract. Contractor will be required to coordinate this work with the agency involved and pay costs the agency may charge in connection with this work.

B. Thereafter, if the actual price for this work is more or less than the allowance, the Contract Price will be adjusted accordingly by Change Order. The adjustment in Contract Price will be made on the basis of the actual invoice price without additional charge or markups for overhead, insurances, bonds, or any other incidental expenses.

C. Contractor will be responsible for all coordination with the agency involved and for the timely completion of the Work to fit his schedule. Contractor will not be allowed any additional compensation for the failure of the agency involved to meet any schedule.

1.03 RELATED REQUIREMENTS

A. The requirements of 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 Owner's purposes, and only by Change Orders which designate amounts to be charged to the Allowance.

E. If the actual price for the specified Allowance is more or less than the stated Allowance, the Contract Price will be adjusted accordingly by Change Order. The adjustment in Contract Price will be made in accordance with the General Conditions.

F. At Project closeout, any amounts remaining in Allowances will be credited to Owner by Change Order.

1.07 SPECIFIC ALLOWANCES

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 Engineer. It is anticipated that the quantity of Work to be completed will vary from the estimated quantities in Section 00 42 43 - Proposal.

C. Owner will make no allowances for items not included in Section 00 42 43 - Proposal.

D. The following pay items contain provisional quantities and have been estimated by the Engineer, based upon the best assumptions for the Work. Work, including but not limited to, the number of lead services to be encountered, the number of driveways to be replaced when replacing services, and the location of water meters inside houses are not known. The Contract unit price for these items will not be increased or decreased due to any increase or decrease in the actual installed quantity.

1. Exploratory Excavation for Existing Utilities
2. Pavement, Remove and Excavate
3. Concrete Sidewalks and Drives, Remove
4. Subgrade Undercut and 21AA Backfill
5. Maintenance Aggregate
6. Aggregate Base Course, 21AA
7. Concrete Pavement w/ Integral Curb, 7 inch
8. Drive and Sidewalk, Concrete, 6 inch
9. Water Service, Water Main to Property Line, K Copper, 1 inch, Short, Trench B (LSLR)
10. Water Service, Water Main to Property Line, K Copper, 1 inch, Long, Directional Bored (LSLR)
11. Curb Stop and Box, 1 inch (LSLR)
12. Water Service, Property Line to Meter, K Copper, 1 inch, Directional Bored (LSLR)
13. Water Service, Connection to Water Meter (LSLR)
14. Sanitary Service, Remove and Replace

1.02 ITEMS OF THE PROPOSAL

A. **Item 1**

Allowance for Permit Fees

1. The Allowance for permit fees will be paid for as a lump sum allowance as defined in the General Conditions and in Section 01 21 00 Allowances. Price paid includes all costs associated with the permit fees required for this project.

2. Once permits have been obtained from the required agencies, provide a complete lump sum price within the allowance to complete the work.

B. **Item 2, 77**

Audio/Video Route Survey

Alt 1: Audio/Video Route Survey

1. Audio-video route survey will be paid for at the Contract lump sum price as specified in the Proposal. Price paid shall be payment in full for all labor, material, equipment, and supplies necessary for furnishing an audio-video route survey in accordance with Section 01 33 00, Submittal Procedures and Section 01 11 00, Summary of Work.

C. **Item 3, 78**

Inspector Days, SRF Ineligible (Contractor to bid number of days)

Alt 1: Inspector Days, SRF Ineligible (Contractor to bid number of days)

1. Inspector Days will be paid for at the Contract unit price per day as specified in the Proposal. Measurement for Inspector Days will be as follows:

2. An Inspector Day shall be construed to mean any day when an operation by the Contractor's work crew (as determined by the Engineer), such as but not limited to construction of the project, restoration, cleanup, and Project follow-up, will require the presence of a Resident Project Representative. An Inspector Day shall also include any time when the presence of a Resident Project Representative is required to determine the status of completion of items identified on the project punch list, involvement with project complaints or other items related to closeout of the construction contract.

3. An Inspector Day shall be computed by adding the total actual hours that each Resident Project Representative spent on the Project and dividing such total number of hours by eight (8) provided that the minimum show-up time when a Work crew elects to not Work shall be four (4) hours. Show-up time will not be included when 12 hours' notice of intent to not Work has been given by the Contractor to the Project Engineer. The cost of Inspector Days will be deducted from the monthly payments to the Contractor and paid to Engineer by Owner. Should the credited amount (number of days indicated by the Contractor in the Proposal) become depleted, the cost of Inspector Days will be deducted from the monthly payments to the Contractor. Upon completion of the Project, any surplus remaining in the Inspector Day bid item will be given to the Contractor.

D. **Item 4, 79**

Mobilization, Max 5%

Alt 1: Mobilization, Max 5%

1. Mobilization will be paid for at the Contract Unit Price per lump sum basis. Price paid shall be payment in full for all labor, material, and equipment necessary for all 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 the Contractor's, Engineer's, and Owner's field offices, and other facilities necessary to undertake the work on the project; and for other work and operations which must be

performed, or for expenses incurred, prior to beginning work on the various contract items on the project site. It shall 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.

2. Payment for mobilization will be based upon the following schedule:

3. When 5% of the original Contract amount is earned, 50% of the Bid price for Mobilization is allowed.

4. When 10% of the original Contract amount is earned, 75% of the Bid price for Mobilization is allowed.

5. When 25% of the original Contract amount is earned, 100% of the Bid price for Mobilization is allowed.

E. **Item 5, 80**

Traffic Maintenance and Control

Alt 1: Traffic Maintenance and Control

1. Traffic maintenance and control will be paid for at the Contract Unit Price on a lump sum basis. Price paid shall be payment in full for all labor, material, and equipment required for maintaining traffic, and shall include, but is not limited to, furnishing, installing, operating, and maintaining all barricades, lighted arrow boards, drums, traffic control devices, signs, channeling devices, cones, flagmen, flag control, pavement markings, warning flashers, concrete barriers, minor traffic devices, and all other items necessary to complete the job, whether specifically mentioned or implied.

F. **Item 6, 81**

Inlet Filter

Alt 1: Inlet Filter

1. Soil erosion and sedimentation control devices will be paid for at the Contract Unit Price per each. Price paid shall be payment in full for all labor, material and equipment necessary to furnish and install soil erosion and sedimentation control devices, and shall include, but is not limited to, furnishing and installing, inlet filters, check dams, ditch sediment traps, temporary gravel construction entrance/exit, and other devices, as shown on the plans or detailed, maintaining devices, replacement of ineffective devices, removal of temporary devices, miscellaneous cleanup and restoration, and all items necessary to complete the Work, whether specifically mentioned or implied.

G. **Item 7, 82**

Exploratory Excavation for Existing Utilities

Alt 1: Exploratory Excavation for Existing Utilities

1. Exploratory excavation of existing utilities will be paid for at the Contract Unit Price per each. Price paid shall be payment in full for all labor, material, and equipment necessary for exploratory excavation for existing utilities as determined by the Engineer, and shall include, but is not limited to establishment of necessary lane, shoulder, and/or sidewalk closures; protection of existing improvements and utilities within the influence of the excavation; grade survey; pavement removal; excavation; hand-digging; utility location; hauling; disposal of excess or unsuitable material including but not limited to asphalt pavement, temporary roadway, approaches and drives, aggregate surfaces, concrete pavement, rocks, earth, large stones, culverts, sewers, structures, and abandoned utilities; excavation, removal, and stockpiling of topsoil; furnishing, placing, and compacting of embedment and backfill; clean up; surface restoration; and for all other items necessary to complete the work, whether specifically mentioned or implied.

2. Measurement for exploratory excavation for existing utilities will be determined per each excavation to a maximum 4-foot diameter by 10-foot deep hole at locations approved by the Engineer.

3. Measurement for exploratory excavation for existing utilities will not be determined per each existing utility throughout the project.

H. **Item 8**

Water Main, 6 inch, Remove

1. Removing pipes, of the type specified, will be paid for at the Contract Unit Price per linear foot. Price paid shall be payment in full for all labor, material, and equipment required for removal of existing piping and shall include, but is not limited to, all excavation, sheeting, shoring, bracing, and dewatering; protection of existing improvements, removal of the existing piping, removing and disposing of all unsuitable material, backfill, backfilling, rebuilding and reconnecting to structures, providing and maintaining a satisfactory sewer bypass service/temporary water service, bulkheading of abandoned structures, maintaining drainage, and all items necessary to complete the job, whether specifically mentioned or implied.

2. Measurement for removing pipe will be by linear feet determined by field measure in place.

I. **Item 9**

End Section, 12 inch, Remove

1. Removal of end sections will be paid for at the Contract Unit Price per each. Price paid shall be payment in full for all labor, material, and equipment necessary to remove the end section as specified on the plans or as determined by the Engineer, and shall include but is not limited to, all excavation, protection of existing improvements, furnishing and compacting fill and topsoil, removal and disposal of excess or unsuitable material, installing the end section and all other items necessary to complete the Work, whether specifically mentioned or implied.

2. Measurement for regrading end section removal will be units removed.

J. **Item 10, 83**

Pavement, Remove and Excavate

Alt 1: Pavement, Remove and Excavate

1. Removal of pavement, regardless of thickness or material, will be paid for at the Contract Unit Price per square yard. Price paid shall be payment in full for all labor, material, and equipment necessary for the removal of pavement and shall include, but is not limited to all sawcutting; excavation, removal, and disposal of integral curbs, base courses (concrete or otherwise), and unsuitable materials; protection of existing improvements; furnishing, placing, and compacting backfill; barricading, miscellaneous restoration or cleanup; and all other items necessary to complete the Work, whether specifically mentioned or implied.

2. Measurement for removal of pavement will be determined by field measure of removed pavement.

K. **Item 11, 84**

Concrete Sidewalks and Drives, Remove

Alt 1: Concrete Sidewalks and Drives, Remove

1. Removal of concrete sidewalks or driveways six (6) inches or less in thickness, will be paid for at the Contract Unit Price per square foot unit basis. Price paid shall be payment in full for all labor, material, and equipment necessary for the removal of concrete

sidewalks or driveways six (6) inches or less in thickness, as shown on the Plans or as determined by the Engineer and shall include, but is not limited to, saw cutting, removal and disposal of unsuitable materials, furnishing, placing and compacting backfill, protection of existing improvements, barricading, and for all items necessary to complete the job, whether specifically mentioned or implied.

2. Measurement for removal of concrete sidewalks or driveways six (6) inches or less in thickness will be in square feet, determined by field measurement.

L. **Item 12**

Guardrail, Remove

1. Removal of beam guardrail will be paid for at the Contract Unit Price per linear foot unit basis. Price paid shall be payment in full for all labor, material, and equipment necessary for the removal of beam guardrail as shown on the Drawings or as determined by the Engineer, and shall include, but is not limited to, the removal of all attached parts and connections, removal and disposal of unsuitable materials, furnishing, placing and compacting backfill, protection of existing improvements, barricading, and for all items necessary to complete the job, whether specifically mentioned or implied.

2. Measurement for removal of beam guardrail will be in linear feet, determined by field measurement.

M. **Item 13**

Wall, Remove

1. Removal of wall will be paid for at the Contract Unit Price per linear foot unit basis. Price paid shall be payment in full for all labor, material, and equipment required for the removal and disposal of the wall to full depth, as shown on Plans, or as determined by Engineer, and shall include, but is not limited to, removal of wall, gates, posts, and footings; removal of all attached parts and connections; removal and disposal of unsuitable materials; furnishing, placing and compacting backfill; protection of existing improvements; barricading; regrading the area, and all items necessary to complete the job, whether specifically mentioned or implied.

2. Measurement for removal of wall will be in linear feet, determined by field measurement

N. **Item 14, 85**

Allowance for Irrigation Damage

Alt 1: Allowance for Irrigation Damage

1. Allowance for removal and replacement of damaged irrigation systems will be paid for as a lump sum allowance as defined in the General Conditions and in Section 01 21 00 Allowances and as invoiced by the company involved. Price paid includes all costs associated labor, material, and equipment required for removal of existing irrigation system and replacing it in as good as or better condition and shall include, but is not limited to, all excavation, protection of remaining system, furnishing and installing valves, piping, connections, fittings, heads, boxes, and controllers; miscellaneous restoration, and all other items necessary to complete the job, whether specifically mentioned or implied.

O. **Item 15**

Tree, Remove

1. Removal of trees and stumps will be paid for at the Contract Unit Price on a per each unit basis. Price paid shall be payment in full for all labor, material, and equipment necessary for the complete removal and disposal of each tree or stump in regardless of size.

2. The removal and disposal of all stumps, hedges, brush, shrubs, roots, and trees having a diameter of less than six (6) inches shall be considered incidental to the Project. Removal of trees in clearing and grubbing areas will not be paid for separately.

P. **Item 16**

Structure, Adjust

1. Adjusting structures will be paid for at the Contract Unit Price on a per each basis. Price paid shall be payment in full for all labor, material, and equipment required to either raise the frame and cover on an existing, otherwise sound structure not more than 12 inches or lower them not more than 6 inches, and shall include, but is not limited to, all sawcutting, removal and disposal of pavement, excavation, construction, bricks, blocks, precast adjustment rings, masonry plaster coat, sand backfill, concrete pavement, installation of frame and cover, cleanout of structure, and all items necessary to complete the job, whether specifically mentioned or implied.
2. Adjusting structures will be measured on an each unit basis for each structure adjusted.

Q. **Item 17, 86**

Subgrade Undercut and 21AA Backfill

Alt 1: Subgrade Undercut and 21AA Backfill

1. Subgrade undercut excavation and backfill will be paid for at the Contract Unit Price per cubic yard unit basis.
2. In cut areas, the price paid shall be payment in full for all labor, material, and equipment necessary for undercut excavation and disposal of all unsuitable material, as determined by the Engineer, below the proposed subgrade elevation, and shall include, but is not limited to, providing, placing, and compacting the undercut backfill material.
3. In fill areas, the price paid shall be payment in full for all labor, material, and equipment necessary for undercut excavation and disposal of all unsuitable material, as determined by the Engineer, below the existing ground elevation and shall include, but is not limited to, the placement and compaction of the undercut backfill material to existing grade.
4. Measurement for subgrade undercut excavation and backfill will be determined by field measurement.

R. **Item 18, 87**

Maintenance Aggregate

Alt 1: Maintenance Aggregate

1. Maintenance aggregate for temporary walks, drives, and roads, will be paid for at the Contract Unit Price per ton. Price paid shall be payment in full for all labor, material, and equipment required for furnishing and installing maintenance aggregate as shown on the plans or determined by the Engineer and shall include, but is not limited to, all construction, protection of existing improvements, excavation, compacting and fine grading subgrade, furnishing, placing and compacting backfill and subbase, furnishing and applying chemical additives and water, also for barricading, and for all items necessary to complete the job, whether specifically mentioned or implied.
2. Measurement for maintenance aggregate will be determined by certified delivery tickets submitted to the Engineer or his duly authorized representative on the job site at the time of delivery. Delivery tickets submitted after the delivery will not be accepted for payment. Stockpiled maintenance aggregate shall be kept separate from other aggregate materials.
3. The delivery tickets shall indicate the scale weight of the material, including chemical additives and moisture content. For material having a moisture content in excess of six (6)

percent, the excess over six (6) percent will be deducted from the scale weight of the material when the moisture content is six (6) percent.

4. Material placed to conform to the cross section and width specified on the Plans or as determined by the Engineer will be paid for at the tonnage basis. If the width of the maintenance aggregate is increased to accommodate the Contractor's operation, the additional material installed beyond the width specified on the Plans or as determined by the Engineer, will be at the Contractor's expense.

S. **Item 19, 88**

Aggregate Base Course, 21AA

Alt 1: Aggregate Base Course, 21AA

1. Aggregate base course, of the type and thickness specified on the Plans, will be paid for at the Contract Unit Price per ton unit basis. Price paid shall be payment in full for all labor, material, and equipment required for the aggregate base course, compacted in place, and shall include, but is not limited to, all excavation, construction, protection of existing improvements, also furnishing, placing, and compacting backfill and subbase, also compacting and fine grading subgrade, also furnishing and applying chemical additives and water, also for barricading, and for all items necessary to complete the job, whether specifically mentioned or implied.

2. Measurement for aggregate base course will be in tons, with the installed tonnage determined by certified delivery tickets submitted to the Engineer or his duly authorized representative. The delivery tickets shall indicate the scale weight of the material, including chemical additives and moisture content. For material having a moisture content in excess of six (6) percent, the excess over six (6) percent will be deducted from the scale weight of the material when the moisture content is six (6) percent. Material placed to conform to the cross section and width specified on the Plans or as determined by the Engineer will be paid for at the tonnage basis. If the width of the base course is increased to accommodate the Contractor in placing forms, etc., the additional material installed beyond the width specified on the Plans or as determined by the Engineer, will be at the Contractor's expense.

T. **Item 20, 21, 22, 23, 89, 90**

Bituminous Leveling Course, 4E10, 2 inch

Bituminous Base Course, 4E10, 4 inch

Bituminous Wearing Course, 5E10, 1.5 inch

Bituminous Wearing Course, 5E10, 2 inch

Alt 1: Bituminous Leveling Course, 4E10, 2 inch

Alt 1: Bituminous Wearing Course, 5E10, 1.5 inch

1. Bituminous pavement, of the type and thickness specified on the Plans, will be paid for at the Contract Unit Price per square yard. Price paid shall be payment in full for all labor, material, and equipment necessary for the bituminous pavement and shall include, but is not limited to, all excavation, protection of existing improvements, also compacting and fine grading subgrade, also furnishing, placing and compacting backfill and subbase, also the furnishing, placing, rolling and compacting the various bituminous lifts or courses or overlays, also the furnishing and applying of prime and bond coats, barricading, restoration, and for all items necessary to complete the job, whether specifically mentioned or implied.

2. Measurement for bituminous pavement will be in square yards, determined by field measurement.

U. **Item 24, 25, 26, 91**

Concrete Pavement w/ Integral Curb, 7 inch

Concrete Pavement w/ Integral Curb, 8 inch

Concrete Pavement w/ Integral Curb, 9 inch

Alt 1: Concrete Pavement w/ Integral Curb, 9 inch

1. Concrete pavement of the type and thickness specified will be paid for at the Contract Unit Price per square yard unit basis. Price paid shall be payment in full for all labor, material, and equipment necessary for construction of concrete pavement; and shall include, but is not limited to, all excavation, construction, and protection of existing improvements; also furnishing, placing and compacting backfill and subbase; also compacting and fine grading subgrade; also the furnishing and installing of hook bolt assemblies, tie bar assemblies, dowel bar assemblies, fillers, and hot-poured elastic joint compound; also forming, placing, jointing, finishing, texturing and curing the concrete; providing protection against rain and cold weather; barricading; pavement gapping; part width construction; miscellaneous restoration; and all other items necessary to complete the job, whether specifically mentioned or implied.
2. Measurement for concrete pavement will be in square yards, determined by field measurement of the concrete in place.

V. **Item 27, 28, 29, 92, 93**

Sidewalk, Concrete, 4 inch

Sidewalk, Ramp and Landing, ADA, Concrete, 6 inch

Drive and Sidewalk, Concrete, 6 inch

Alt 1: Sidewalk, Concrete, 4 inch

Alt 1: Sidewalk, Ramp and Landing, ADA, Concrete, 6 inch

1. Sidewalks, sidewalk ramps, and driveway approaches, of the thickness specified on the Plans, will be paid for at the Contract Unit Price per square foot. Price paid shall be payment in full for all labor, material, and equipment necessary for construction of sidewalks, sidewalk ramps and driveway approaches; and shall include, but is not limited to, all excavation, construction, and protection of existing improvements; also 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 all other items necessary to complete the job, whether specifically mentioned or implied.
2. Measurement for sidewalks, sidewalk ramps, or driveway approaches, will be in square feet, field measured in place.
3. 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.

W. **Item 30, 94**

Restoration w/ 3 inches Topsoil, Seed, Fertilizer, and Mulch

Alt 1: Restoration w/ 3 inches Topsoil, Seed, Fertilizer, and Mulch

1. Watering, fertilizing and cultivating, (for the establishment period specified) will be paid for at the Contract Unit Price per lump sum. Price paid shall be payment in full for all labor, material, and equipment required for maintaining all planted material in a vigorous, healthy, sound growing condition and shall include, but is not limited to, cultivating, weeding, pruning, watering, fertilizing, mulching, reguying, repairing or replacing

damaged, diseased, dead, or infested plant material, and all other items necessary to complete the job, whether specifically mentioned or implied.

X. **Item 31**

Gate Valve and Well, Abandon

1. Abandonment of existing gate valve and well structures will be paid for at the Contract Unit Price per each. Price paid shall be payment in full for all labor, materials, and equipment required for abandoning existing gate valve and well, and shall include, but is not limited to, all excavation, sheeting, bracing, shoring, draining, and dewatering; backfilling (including backfill with special materials where specified); disposal of excess excavated material; removing and salvaging gate valve; removing and salvaging well frame and cover; cleanup; restoration; and all other items necessary to complete the job, whether specifically mentioned or implied.
2. Abandonment of gate valve and well structures will be measured as units abandoned.

Y. **Item 32, 95**

Gate Valve and Well, Remove

Alt 1: Gate Valve and Well, Remove

1. Removing gate valves and associated well structures or valve boxes will be paid for at the Contract Unit Price per each. Price paid shall be payment in full for all labor, materials, and equipment required for removing existing gate valve and well or gate valve and box, and shall include, but is not limited to, all excavation, sheeting, bracing, shoring, draining, and dewatering; backfilling (including backfill with special materials where specified); disposal of excess excavated material; protection of existing improvements; removing and salvaging gate valve; removing and salvaging valve box; removing and salvaging well frame and cover; removing valve well; cleanup; restoration; and all other items necessary to complete the job, whether specifically mentioned or implied.
2. Removing gate valves and associated well structures or valve boxes will be measured as units removed.

Z. **Item 33, 96**

Fire Hydrant, Remove

Alt 1: Fire Hydrant, Remove

1. Removing fire hydrants will be paid for at the Contract Unit Price per each. Price paid shall be payment in full for all labor, material, and equipment necessary for removing fire hydrant, and shall include, but is not limited to, all excavation, sheeting, bracing, shoring, dewatering, and backfilling; disposal of excess excavated material; protection of existing improvements; removing thrust blocks; restoration; cleanup; removal of fire hydrant, valve, valve boxes, and connecting piping; capping of existing water main; salvaging and delivering hydrant, gate valve, and valve box to the Owner; cleanup; restoration; and all other items necessary to complete the job, whether specifically mentioned or implied.
2. Removing fire hydrant will be measured as units removed.

AA. **Item 34, 35, 97**

Existing Water Main, 6 inch, Abandon with Flowable Fill

Existing Water Main, 8 inch, Abandon with Flowable Fill

Alt 1: Existing Water Main, 8 inch, Abandon with Flowable Fill

1. Abandoning water main will be paid for at the Contract Unit Price per cubic yard of flowable fill pumped into the existing mains. Price paid shall be payment in full for all labor, material, and equipment necessary for abandoning water main, and shall include, but is

not limited to, all excavation, sheeting, bracing, shoring, draining, dewatering, and backfilling (including backfilling with special materials where specified); disposal of excess excavated material; protection of existing improvements; all special fittings; plugging existing taps from water services; filling with flowable fill; cleanup; restoration; and all other items necessary to complete the job, whether specifically mentioned or implied.

2. Measurement for abandoning water main shall be by certified batch plant delivery tickets of flowable fill submitted to Engineer at time of placement.

BB. **Item 36, 37, 98**

Cut and Plug Existing 6 inch Water Main

Cut and Plug Existing 8 inch Water Main

Alt 1: Cut and Plug Existing 8 inch Water Main

1. Cut and plug existing water main will be paid for at the Contract Unit Price per each. Price paid shall be payment in full for all labor, material, and equipment necessary for cutting and plugging the existing water main, and shall include, but is not limited to, all excavation, sheeting, bracing, shoring, dewatering, and backfilling; disposal of excess excavated material; protection of existing improvements; cutting existing water main; furnishing and installing plugs, thrust blocks, and restraints; barricading; restoration; cleanup; and all other items necessary to complete the job, whether specifically mentioned or implied.
2. Cutting and plugging existing water main will not be paid for where a connection to an existing water main is paid.

CC. **Item 38**

Water Main, 8 inch, HDPE SDR 11, Enclosed in Steel Casing

1. Water main in bored or open-cut steel casing will be paid for at the Contract Unit Price per linear foot of casing installed. Price paid shall be payment in full for all labor, material, and equipment necessary for furnishing and installing water main in bored or open-cut steel casing, and shall include, but is not limited to, furnishing water main, casing pipe, boring pit, all necessary excavation, sheeting, shoring and bracing, dewatering, disposal of excess excavated material, grouting, backfilling, barricading, restoration, and all other items necessary to complete the job, whether specifically mentioned or implied.
2. Water main in bored or open-cut steel casing will be field measured in linear feet of casing placed.

DD. **Item 39, 40, 99**

Water Main, 8 inch, HDPE SDR 11, Directional Bore

Water Main, 12 inch, HDPE SDR 11, Directional Bore

Alt 1: Water Main, 12 inch, HDPE SDR 11, Directional Bore

1. Water main, of the type, diameter and class specified, directional bored (also known as horizontal directional drilling), will be paid for at the Contract Unit Price per linear foot. Price paid shall be payment in full for all labor, material, and equipment necessary for furnishing and installing directional bored water main, and shall include, but is not limited to, sheeting, shoring, bracing, dewatering, jointing, testing and disinfecting; excavating boring pits; disposal of excess excavated material; protection of existing improvements; draining; potholing; boring water main; grouting; excavating utility crossings; backfilling boring pits (including backfill with special materials where specified); excavating and installing fittings; temporary blow-offs; thrust blocks; thrust restrainers; encasement; barricading; restoration; final cleanup; and all other items necessary to complete the job, whether specifically mentioned or implied.

2. Measurement for water main directional bored will be in linear feet along the centerline of the pipe taken from end-to-end with no reduction for fittings, boring pits, and valves except for special structures, sections or connections for which either lump sum or unit prices have been taken will be deducted from the total length of water main and will be paid for at the prices bid therefor.

EE. **Item 41, 42, 100**

Water Main, 8 inch, HDPE SDR 11, Pipe Burst Ex 6 inch

Water Main, 8 inch, HDPE SDR 11, Pipe Burst Ex 8 inch

Alt 1: Water Main, 12 inch, HDPE SDR 11, Pipe Burst Ex 8 inch

1. Water main, of the type, diameter, and class specified, pipe burst, will be paid for at the Contract Unit Price per linear foot. Price paid shall be payment in full for all labor, material, and equipment necessary for bursting the existing pipe and furnishing and installing new water main, and shall include, but is not limited to, sheeting, shoring, bracing, dewatering, draining, jointing, testing and disinfecting; excavating boring pits; disposal of excess excavated material; protection of existing improvements; potholing; excavating and exposing bends, valves, fittings, connections, utility crossings, and related items; removal of extraneous piping associated with replacement of 90-degree bends; installing fittings; fusing pipe and fittings; temporary blow-offs; thrust blocks; thrust restrainers; disinfecting, testing, encasement; barricading; backfilling boring pits and other excavations (including backfill with special materials where specified); miscellaneous restoration; cleanup; and all other items necessary to complete the job, whether specifically mentioned or implied.
2. Water main pipe burst will be field measured in linear feet from end to end with no reduction for boring pits, fittings, and valves.

FF. **Item 43, 44, 45, 46, 47, 101, 102, 103**

Water Main, Connection to Existing, 6 inch MJ Solid Sleeve

Water Main, Connection to Existing, 8 inch MJ Solid Sleeve

Water Main, Connection to Existing, 8 inch x 8 inch Tee and Cutting In Sleeve

Water Main, Connection to Existing, 12 inch x 8 inch Tee and Cutting In Sleeve

Water Main, Connection to Existing, 16 inch x 8 inch Tee and Cutting In Sleeve

Alt 1: Water Main, Connection to Existing, 8 inch MJ Solid Sleeve

Alt 1: Water Main, Connection to Existing, 12 inch x 8 inch Tee and Cutting In Sleeve

Alt 1: Water Main, Connection to Existing, 16 Inch x 12 inch Tee and Cutting In Sleeve

1. Connection to existing water main, of the size and types specified, will be paid for at the Contract Unit Price per each. Price paid shall be payment in full for all labor, material, and equipment necessary for connecting new water main to existing water main, and shall include, but is not limited to, all excavation, sheeting, bracing, shoring, draining, dewatering, and backfilling (including backfill with special materials where specified); disposal of excess excavated material and backfill; protection of existing improvements; laying; jointing; bedding; testing; disinfecting; furnishing and installing miscellaneous water main pipe, fittings, thrust blocks, restraints, and adapters; connection to new water main; capping old water main; thrust blocks; restoration; cleanup; and all other items necessary to complete the job, whether specifically mentioned or implied.
2. Connection to existing water main will be measured per each connection made. Connection to existing water main is not paid for separately where a tapping sleeve, valve and well, or valve box is being paid for.

GG. **Item 48**

Water Service, Connection to Water Main, Corp and Saddle

1. Connection of water services, of the type specified, will be paid for at the Contract Unit Price per each. Price paid shall be payment in full for all labor, material, and equipment necessary for disconnecting existing water services from the existing main and connecting new and existing services to the new water main; and shall include, but is not limited to, all excavation, sheeting, bracing, shoring, and dewatering; protection of existing improvements; all water service pipe; water service tap and corporation stop; special fittings; connection to new water main (including service saddle); backfilling (including backfill with special materials where specified); disposal of excess excavated material; barricading; final cleanup; and all other items necessary to complete the job, whether specifically mentioned or implied.
2. Connection of water services will be measured as units installed.

HH. **Item 49, 50, 51, 52, 60, 61, 104, 110, 111**

Water Service, Water Main to Property Line, K Copper, 1 inch, Short, Trench B

Water Service, Water Main to Property Line, K Copper, Greater Than 1 inch, Short, Trench B

Water Service, Water Main to Property Line, K Copper, 1 inch, Long, Directional Bored

Water Service, Water Main to Property Line, K Copper, Greater Than 1 inch, Long, Directional Bored

Water Service, Water Main to Property Line, K Copper, 1 inch, Short, Trench B (LSLR)

Water Service, Water Main to Property Line, K Copper, 1 inch, Long, Directional Bored (LSLR)

Alt 1: Water Service, Water Main to Property Line, K Copper, Greater Than 1 inch, Long, Directional Bored

Alt 1: Water Service, Water Main to Property Line, K Copper, 1 inch, Short, Trench B (LSLR)

Alt 1: Water Service, Water Main to Property Line, K Copper, 1 inch, Long, Directional Bored (LSLR)

1. Water service lines, of the type specified, will be paid for at the Contract Unit Price per each. Price paid shall be payment in full for all labor, material, and equipment necessary for furnishing and installing water service lines, and shall include, but is not limited to, all excavation, sheeting, bracing, shoring, dewatering, and backfilling; disposal of excess excavated material; protection of existing improvements; all water service pipe, corporation stops, service saddle, and special fittings; connection to new water main; restoration; cleanup; and all other items necessary to complete the job, whether specifically mentioned or implied.
2. Water service lines will be measured as units installed.
3. Short services refer to connecting from a mainline water main to a property on the same side of the street as the mainline.
4. Long services refer to connecting from a mainline water main to a property on the opposite side of the street of the mainline, bored under the roadway.

II. **Item 53, 54, 62, 105, 112**

Curb Stop and Box, 1 inch

Curb Stop and Box, Greater Than 1 inch

Curb Stop and Box, 1 inch (LSLR)

Alt 1: Curb Stop and Box, Greater Than 1 inch

Alt 1: Curb Stop and Box, 1 inch (LSLR)

1. Curb stop and box will be paid for at the Contract Unit Price per each. Price paid shall be payment in full for all labor, material, and equipment required for installation of new curb stop and new curb box on existing and/or new water service line, and shall include, but is not limited to, all excavation, sheeting, bracing, shoring, dewatering, and backfilling; disposal of excess excavated material; protection of existing improvements; connection to existing and/or proposed water service line; restoration; cleanup; and all other items necessary to complete the job, whether specifically mentioned or implied.
2. This item will be used at the discretion of the Engineer when an existing water service line cannot be connected to the existing curb stop or whenever determined by the Engineer.

JJ. **Item 55**

Fire Hydrant Assembly

1. Fire hydrant assemblies will be paid for at the Contract Unit Price per each. Price paid shall be payment in full for all labor, material, and equipment necessary for furnishing and installing fire hydrant assemblies, and shall include, but is not limited to, all excavation, sheeting, bracing, shoring, dewatering, and backfilling; protection of existing improvements; also valves, valve boxes, fittings, thrust blocks, and connecting piping to water main; connection to water main; disposal of excess excavated material; restoration; cleanup; and all other items necessary to complete the job, whether specifically mentioned or implied.
2. Hydrant assemblies will be measured as units installed.

KK. **Item 56, 108**

Tapping Sleeve, 12 inch x 8 inch, Valve and Well

Alt 1: Insertion Valve and Well, 16 Inch

1. Tapping valve assembly and well, as well as insertion valve assembly and well, will be paid for at the Contract Unit Price per each as specified in the Proposal. Price paid shall be payment in full for all labor, material, and equipment necessary for tapping existing water main, and shall include, but is not limited to, tapping sleeve, tapping valve, restraints, valve well foundation, valve well, steel reinforcing, adjusting rings, well frame and cover, cement mortar plaster coat, all necessary excavation, sheeting and bracing, shoring, dewatering, backfilling, tapping water main, disposal of excess excavated material, thrust blocks, restoration, cleanup, and all other items necessary to complete the job, whether specifically mentioned or implied.
2. Tapping valve assembly and well will be measured as units installed.

LL. **Item 57, 58, 59, 109**

Gate Valve and Well, 6 inch

Gate Valve and Well, 8 inch

Gate Valve and Well, 12 inch

Alt 1: Gate Valve and Well, 12 inch

1. Valves and wells or valve boxes will be paid for at the Contract Unit Price per each. Price paid shall be payment in full for all labor, material, and equipment necessary for furnishing and installing valve and well or valve box, and shall include, but is not limited to, all excavation, sheeting, bracing, shoring, dewatering, and backfilling; also valve, valve well foundation, valve well sections, well frame and cover, cement mortar plaster coat, steel reinforcing, bricks, blocks, adjusting rings, restraints and valve box; disposal of excess excavated material; protection of existing improvements; thrust blocks; connection to water main; restoration; cleanup; and all other items necessary to complete the job, whether specifically mentioned or implied.
2. Valves and wells will be measured as units installed.

MM. **Item 63, 113**

Water Service, Property Line to Meter, K Copper, 1 inch, Directional Bored (LSLR)

Alt 1: Water Service, Property Line to Meter, K Copper, 1 inch, Directional Bored (LSLR)

1. Water service lines, of the type specified, directional bored, from the curb stop to the meter inside the house, will be paid for at the Contract Unit Price per each. Price paid shall be payment in full for all labor, material, and equipment necessary for furnishing and installing water service lines; and shall include, but is not limited to, any necessary excavation, sheeting, bracing, shoring, draining, dewatering, boring, grouting, jointing, testing, disinfecting, and backfilling; excavation of boring pits and exit pits; disposal of excess excavated material; furnishing and installing water service pipe and special fittings; connection to existing water service line; cleanup; and all other items necessary to complete the job, whether specifically mentioned or implied.
2. Water service lines will be field measured as service lines installed.

NN. **Item 64, 114**

Water Service, Connection to Water Meter (LSLR)

Alt 1: Water Service, Connection to Water Meter (LSLR)

1. Water service connection to water meter will be paid for at the Contract Unit Price per each. Price paid shall be payment in full for all labor, material, and equipment required for entering a building on a property and connecting a new water service line to an existing or proposed water meter; and shall include, but is not limited to, all excavation; sheeting, shoring and bracing; installation of water service through foundation, footings, or floors; all necessary piping, fittings, and connectors; obtaining permits and inspections; restoration of site furnishings, landscaping, and appurtenances; and all other items necessary to complete the Work, whether specifically mentioned or implied.
2. Water service connection to water meter will be measured as unit connected.

OO. **Item 65, 66, 67, 68, 69, 70**

Cleaning, Sanitary Sewer, 12 inch

Cleaning, Sanitary Sewer, 15 inch

Cleaning, Sanitary Sewer, 18 inch

Cleaning, Sanitary Sewer, 24 inch

Cleaning, Sanitary Sewer, 32 inch

Cleaning, Sanitary Sewer, 36 inch

1. Sewer cleaning, regardless of size, will be paid for at the Contract Unit Price per linear foot unit basis. Price paid shall be payment in full for all labor, material, and equipment necessary for cleaning sewer pipe and shall include, but is not limited to, removal of all dirt, debris, sand, sludge, grease, mud, rocks, stones, roots and miscellaneous materials from the sewer; cleaning all manholes, removal and disposal of all resultant debris, restoration of any damage, obtaining access to sewers, sewer flow control, and any other items necessary to complete the work whether specifically mentioned or implied.
2. Measurement for sewer cleaning shall be from center of manhole to center of manhole for the sewer section cleaned. Payment for cleaning of a sewer section shall be made one time during the project. Any re-cleaning required after the initial cleaning shall be incidental to the Project.

PP. **Item 71, 72**

Pre-Television Inspection, Sanitary Service, Mainline to Property Line

Post-Television Inspection, Sanitary Service, Mainline to Property Line, SRF Ineligible

1. Pre and post television inspection of sanitary services, regardless of size, will be paid for at the Contract Unit Price per each. Price paid shall be payment in full for all labor, materials, and equipment required to do a complete closed-circuit television inspection of laterals on the side of the street where water main is proposed from the mainline to the property line and shall include, but is not limited to, taking an elevation of the lateral at the location of the proposed pipe, color video with audio description, sewer flow control, obtaining access to sewers, restoration of any damage, PACP coding, GIS database integration, preparation of a written condition report, preparation of data base, delivery of report and one copy of the video to the Owner, and all items necessary to complete job whether specifically mentioned or implied.
2. Payment for pre and post television inspection for each sanitary services will be per each. This item will be used at the discretion of the Engineer. Any necessary re-televising or remobilization required to complete the inspection for a sanitary service is considered incidental to the Project.

QQ. **Item 73, 115**

Sanitary Service, Remove and Replace

Alt 1: Sanitary Service, Remove and Replace

1. Removal and replacement of sanitary sewer service lines will be paid for at the Contract Unit Price per each. Price paid shall be payment in full for all labor, material, and equipment required for removal and replacement of existing sanitary service lines and shall include, but is not limited to, all excavation, disposal of excess excavated material, sheeting, shoring, bracing and dewatering, protection of existing improvements, removal and disposal of existing service line, maintaining flow, re-establishing service lead, connection to existing piping, furnishing and installing rubber adapters, sand backfill, pipe bedding, placing and removing stoppers and bulkheads, barricading, restoration, and all

other items necessary to complete the job, whether specifically mentioned or implied. This item will be used at the discretion of the Engineer.

RR. **Item 74**

End Section With Animal Grate For 12 Inch Culvert, Concrete

1. End sections of the size and type specified will be paid for at the Contract Unit Price per each. Price paid shall be payment in full for all labor, material, and equipment required for furnishing and installing end sections and shall include, but is not limited to, all excavation, sheeting, shoring and bracing, construction, dewatering, preparation, protection of existing improvements, stone pipe bedding, sand backfill, connection to existing culvert or sewer, backfilling, barricading, restoration, and all other items necessary to complete the job, whether specifically mentioned or implied.
2. End sections will be measured as units installed.

SS. **Item 75**

Guardrail, Type T

1. Steel beam guardrail will be paid at the Contract Unit Price per linear foot, in place. Price paid shall be payment in full for all labor, material, and equipment necessary for furnishing and installing guardrail and shall include, but is not limited to, buffered end sections, end shoes, steel fasteners, specials, wire rope and fittings, reflectorized washers, wood posts, concrete anchorage, all necessary excavation and backfill, repair of galvanized surfaces, barricading, and all other items necessary to complete the job, whether specifically mentioned or implied.
2. Guardrail will be field measured in linear feet along the face of the rail.

TT. **Item 76**

Guardrail, Reflectors

1. Guardrail reflectors will be paid at the Contract Unit Price per linear foot, in place per the latest edition of MDOT's Standard Specifications for Construction.
2. Guardrail reflectors will be field measured per unit installed.

UU. **Item 106**

Alt 1: Fire Hydrant Assembly, Pipe Burst to Mainline

1. Fire hydrant assemblies, for which the pipe will be pipe burst to the mainline, will be paid for at the Contract Unit Price per each. Price paid shall be payment in full for all labor, material, and equipment necessary for furnishing and installing fire hydrant assemblies, and shall include, but is not limited to, all excavation, sheeting, bracing, shoring, dewatering, and backfilling; draining, jointing, testing and disinfecting; excavating boring pits; disposal of excess excavated material; protection of existing improvements; potholing; excavating and exposing bends, valves, fittings, connections, utility crossings, and related items; also valve boxes, thrust blocks, and connecting piping to water main; connection to water main; installing fittings; fusing pipe and fittings; temporary blow-offs; thrust restrainers; disinfecting, testing, encasement; barricading; backfilling boring pits and other excavations (including backfill with special materials where specified); disposal of excess excavated material; restoration; cleanup; and all other items necessary to complete the job, whether specifically mentioned or implied.
2. Hydrant assemblies will be measured as units installed with no reduction for fittings, boring pits, and valves.

VV. **Item 107**

Alt 1: Fire Hydrant Assembly, Directional Bore to Mainline

1. Fire hydrant assemblies, for which the pipe will be directionally drilled to the mainline, will be paid for at the Contract Unit Price per each. Price paid shall be payment in full for all labor, material, and equipment necessary for furnishing and installing fire hydrant assemblies, and shall include, but is not limited to, all excavation, sheeting, bracing, shoring, dewatering, and backfilling; jointing, testing and disinfecting; excavating boring pits; disposal of excess excavated material; protection of existing improvements; draining; potholing; boring water main; grouting; excavating utility crossings; backfilling boring pits (including backfill with special materials where specified); also valves, valve boxes, fittings, thrust blocks, and connecting piping to water main; connection to water main; disposal of excess excavated material; thrust restrainers; encasement; barricading; restoration; cleanup; and all other items necessary to complete the job, whether specifically mentioned or implied.
2. Hydrant assemblies will be measured as units installed with no reduction for fittings, boring pits, and valves.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

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. Owner
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 Owner, 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 Owner within seven (7) days of meeting for review at the next meeting.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 16 - CONSTRUCTION PROJECT SCHEDULE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Contractor will be responsible for the Project construction schedule for the full Contract Time, including without limitation the following:

1. Contractor's construction schedule updates will be submitted on a monthly basis, or as requested by Owner.

2. Contractor's short-term look-ahead schedule submitted at each progress meeting and as required by the Owner.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 33 00 - Submittal Procedures

1.03 DEFINITIONS

A. Activity: A discrete part of a project that is identified in the Contractor's planning, scheduling, executing, monitoring, and controlling of the construction Project. Activities included in a construction schedule consume time and resources.

B. Critical Activity: An activity on the critical path of the construction schedule.

C. Predecessor Activity: An activity that precedes another activity in the network.

D. Successor Activity: An activity that follows another activity in the network.

E. Cost Loading: The allocation to each activity within the Critical Path Method (CPM) Schedule of the portion of the Contract Price reflecting the Contractor's anticipated costs to perform that portion of the Work, including a proportional share of overheads and profit. The sum of costs for all activities must equal the total Contract Sum. The cost loaded CPM Schedule will be referenced to the contract, purchase order line item, and bid breakdown item.

F. Critical Path Method (CPM): Scheduling method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path to complete the Work of the Project within the specified Contract Times and interim completion milestones.

G. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

H. Event: The starting or ending point of an activity.

I. Free Float: is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.

J. Total Float: is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.

K. Contract Float: is the measure, in calendar days, of leeway between the Contractor's anticipated date for completion of all or any part of the Work and the corresponding specified Contract Time regardless of the float values calculated by the software used to produce the CPM Schedule.

L. Resource Loading: The allocation of labor and equipment necessary for completing an activity as scheduled.

M. Work Breakdown Structure (WBS): A deliverable-oriented breakdown of a project into smaller components. A work breakdown structure is a key project deliverable that organizes the team's work into manageable sections.

N. Detailed Cost Breakdown (DCB): An itemized breakdown of the Work and Contract Amount detailing quantities and dollar amounts for each pay item, developed by summarizing the cost-loaded CPM schedule to a level of detail appropriate for use in progress payment estimates. The sum of all pay items will equal the Contract Price.

O. Milestone: The date of a significant event, used to monitor schedule performance and define Contract deadlines.

P. Data Date: The reporting cut-off date through which progress is incorporated into a schedule.

Q. The term “day” as used in these Contract Documents will mean calendar day unless otherwise specifically designated. Contract Time computations will be made in Days. Total Float and Contract Float values computed in Working Days will be converted to Days when such computations are made for the purpose of calculating changes in Contract Time.

1.04 CPM SCHEDULE

A. Contractor's approach to prosecution of the Work will be disclosed by submission of computerized, cost-and-resource loaded CPM Schedules as required herein. These requirements are in addition to, and not in limitation of, those imposed elsewhere in the Contract Documents.

B. CPM Schedule Submittals are intended to show:

1. the priority and sequencing by which the Contractor intends to execute the Work (or Work remaining) to comply with the Contract Times, those sequences of Work indicated in or required by the Contract Documents and any other requirements of the Contract Documents;

2. how the Contractor anticipates foreseeable events, site conditions and all other general, local and prevailing conditions that may in any manner affect cost, progress, schedule, performance and furnishing of the Work;

3. how the Means and Methods chosen by the Contractor translate into Activities and sequencing;

4. the actual timing and sequencing of completed Work; and

5. the allocation of the Contract Price and construction craft labor hours to the Activities.

C. CPM Schedule will clearly define the prosecution of the Work from Date of Commencement of the Contract Time to Final Completion by using separate CPM Activities for, but not limited to:

Notice to Proceed, submittal, resubmittal, review and approval of basis of design, preliminary design and final design (applicable for design/build contracts); construction/installation; permitting (by the Contractor and Owner); workshops (instrumentation, software, and controls), submittal preparation; submittal review and return, resubmission and re-review; mechanical, electrical, controls systems and information systems layout drawings; procurement and fabrication; deliveries to the site or storage; Owner-furnished items; interfaces with other work (other contractors, public utilities, etc.); planned shutdowns or other impacts to Owner's operating equipment or facilities; start-up and testing of the equipment/system; Field Acceptance Test (FAT); Site Acceptance Test (SAT) for controls; Substantial Completion, final inspection; Owner training; O&M and Training Manuals; punch list; final clean-up; submittal of as-built drawings and other record documents; close-out; and Final Completion.

D. The CPM Schedule will detail CPM Activities and logic ties as required to demonstrate the Contractor's approach to all the Work. CPM Activity durations will equate to the days required to complete the associated Work. Activities will not combine:

   1. separate items of Unit Price or lump sum Work;

   2. distinct classes of Work (e.g., CSI Divisions or equivalent);

   3. Work in separate areas, structures or facilities and, if requested by Engineer, Work in separate locations or elevations within an area, structure or facility; or

   4. rough-in and finish Work.

E. Start-to-finish relationships and negative lags will not be utilized unless approved in advance by the Engineer. Activities will be cost and resource loaded.

F. The activities will form a complete network wherein all activities (except for the start and completion milestones) will have at least one predecessor and one successor. Each activity will have as many predecessor or successor activities as is necessary to accurately reflect the requirements to complete the work. The number of activities and level of detail in the schedule will be subject to the Engineer's review.

G. Schedule calendars must be developed to accurately reflect the working times for each activity based on the specific requirements of the project. If not specified, assume 5 calendar days and 40 hours per week. Observed federal, state and non-work holidays should be included, as appropriate.

H. Installation CPM Activities will last from 15 to 45 days unless a shorter or longer duration is required to properly depict the Work. The schedule will provide not less than 30 days for each submittal review or re-review activity and for each submittal will include separate activities for review, re-submittal, and re-review. Submittal, delivery and start-up CPM Activities may combine materials and equipment in the same class of Work, based on the detail of related installation CPM Activities. Furnish, install, and test will be separate activities. Contractor will include weather contingencies and other anticipated/foreseeable events/conditions in the schedule and the schedule narrative.

I. Contractor will refrain from constraining activity dates in the schedule other than Contract milestones. If the Contractor feels constraints are necessary, the Contractor will detail the reasons for the constraints to the Engineer and in the schedule narrative and will require approval of their use.

J. Activities will be assigned consistent descriptions, activity identification, Work Breakdown Structure, and activity codes consistent with schemes provided by the Engineer or, if none is provided, with the Engineer's approval. For each activity, separate activity codes will be provided for work location, phase of work, responsible firm (Contractor, a Subcontractor or a Supplier), system, specification section, and DCB item. Constraint dates/basis will be explained.

K. The CPM Schedule will be prepared using the latest version of Oracle Corporation Primavera P6 Project Management Software unless the Engineer determines that integration with the IMS is not required or Contractor proposes a similar software that can be used for scheduling that is acceptable to the Engineer.

L. Unless otherwise approved by the Engineer, CPM schedule calculations will be performed:

1. utilizing retained logic in lieu of progress override;
2. using expected finish dates;
3. with critical activities defined as the longest path;
4. with total float defined as the smallest of start float or finish float; and
5. with the predecessor calendar used for lags.

M. In preparing CPM Schedules, it is the Contractor's responsibility to:

1. request interpretations from the Engineer, as warranted
2. point out to the Engineer, by specific, separate notation, any aspects of the CPM Schedule that may reflect variations from the Contract Documents
3. work with Subcontractors and Suppliers in finalizing Activities and logic ties.

N. Early Dates in the CPM Schedule will be based on proceeding with all or part of the Work exactly on the date when the corresponding Contract Time commences to run. Late Dates will be based on completing all or part of the Work exactly on the corresponding Contract Time, regardless of whether the Contractor anticipates early completion or not. If sequences of Work are indicated in or required by the Contract Documents, the CPM Schedule will show in detail the Contractor's approach to conforming with those sequences.

O. A narrative will accompany all CPM Schedule submittals which will:

1. Discuss the Contractor's planning and approach to the Project and any changes therein;
2. Identify planned staffing, resources, and work hours;
3. Identify the basis for any constraints incorporated into the CPM schedule;
4. Itemize shifts, non-Working Days and any multiple calendars applied to the CPM Activities;
5. Compare current activity dates and the Contract Times;
6. Recap progress and days gained or lost vs. the As-Planned Schedule;
7. Provide activity reporting based on the CPM Schedule discussing progress by CPM Activity;

8. Detail Contractor's Site Management Plan, Construction Equipment Usage, Labor Buildup over first three months and de-staffing plans (when applicable);
9. Describe all changes in resources to be used on remaining Work;
10. Identify delays and causes and any actions taken to mitigate impact;
11. Explain the basis for any logic ties other than finish-to-start (FS), and for each lag incorporated into the schedule;
12. Define abbreviations used in the schedule;
13. Itemize any revisions made in the activities or Work sequences, and
14. Identify all approved logic changes.

P. The narrative will include monthly and cumulative plots of planned and actual manpower and payments, in a form acceptable to the Engineer, comparing the Contractor’s anticipated rate of progress in the most current CPM Schedule Submittal and that anticipated in the As-Planned Schedule.

Q. CPM Schedule submittals will include:

1. Electronic copies of the Contractor's native P6 schedule files (.xer);
2. A narrative;
3. Activity report/Gantt charts including CPM Activity code, description, duration, calendar, Early and Late Dates (calendar dates), Total Float, labor man-hours, cost, and sort codes. The Late Finish Date (or the Early Start Date) of any CPM Activity highlighting a Contract Time (or commencement of all or any part of the Work) will equal the corresponding Contract Time (or Contract date). Provide PDF file (11-inch x 17-inch printable, with headers and footers).
4. S-curves showing projected early and late earnings and earnings to date;
5. Total contract earnings report detailing contract value to date, total contract earnings to date and current period earnings by activity, sorted and subtotaled by responsibility, with actual, early start, early finish, late start and late finish dates;
6. Total Float report
7. Critical path
8. Other reports and Gantt charts as designated by the Engineer
9. Three (3) color copies and an electronic pdf copy of all of the above items.
10. Critical paths with zero or negative Total Float will be shown in red. If the Contractor plans to finish the work earlier than the Substantial Completion Date and Final Completion Date, then the activities with minimum Total Float will be identified in red color as the near critical path.
11. Schedule update reports will include the prior update baseline.

R. Each CPM Schedule Submittal will bear the Contractor's stamp or written indication of approval as representation to the Owner that the Contractor has determined or verified all data on that CPM Schedule, and that the Contractor and the Subcontractors and Suppliers have reviewed and coordinated the sequences in that CPM Schedule with the requirements of the Work. CPM Schedule Submittals are not Contract Documents.

S. Owner’s review of CPM Schedule Submittals may result in comments relating to conformance with:

1. the Contract Times,

2. those sequences of Work indicated in or required by the Contract Documents

3. any other Contract Document requirements that may have a significant bearing on the use of CPM Schedule Submittals to resolve issues affecting Contract Price and/or Contract Time. The review of CPM Schedule Updates may, in addition result in comments as to whether the Contractor’s scheduling of Work remaining continues to conform with the Contract Times and those sequences of Work indicated in or required by the Contract Documents. Review comments may also respond to Contractor’s proposed schedule recovery plans, when and as appropriate, and to Contractor requests for extensions in Contract Time. CPM Schedule review comments may also result in the selection of Targets and recording of Target Times.

T. The review of CPM Schedule Updates may, in addition result in comments as to whether the Contractor’s scheduling of Work remaining continues to conform with the Contract Times and those sequences of Work indicated in or required by the Contract Documents. Review comments may also respond to Contractor’s proposed schedule recovery plans, when and as appropriate, and to Contractor requests for extensions in Contract Time. CPM Schedule review comments may also result in the selection of Targets and recording of Target Times.

U. No CPM Schedule review by the Engineer will relieve the Contractor from the responsibility to:

1. comply with the Contract Times and any sequences of Work indicated in or required by the Contract Documents

2. complete omitted Work within the Contract Times.

Nor will any such CPM Schedule review by the Engineer lead to approval of, or consent to, any variation from the Contract Documents.

V. CPM Schedule reviews will not impose on the Owner any responsibility for:

1. the means, methods, sequences or techniques by which the Contractor plans and executes the Work;

2. verifying whether Work is omitted;

3. Activity durations are reasonable;

4. the adequacy of the level of labor, materials and construction equipment;

5. the reasonableness of the Contractor’s chosen Means and Methods; or

6. whether Work sequences and Activity timing are practicable.

Even if any comments or objections are noted from the reviews of CPM Schedule Submittals, no such reviews or objections noted will be effective or construed to create or impose on the Owner or Engineer any responsibility for the timing, planning, scheduling or execution of the Work or for the correctness of any such CPM Schedule details. The correctness of the CPM Schedule will remain the sole responsibility of the Contractor.

W. The initial CPM Schedule is known as Revision 0 (Rev. 0) and, once approved by the Engineer, becomes the As-Planned Schedule and the initial Record Baseline Schedule. Within 30 days following the Contract Start Work Date, Contractor will provide the Rev. 0 cost-loaded CPM Schedule Submittal and a list of all project submittals for Engineer's review and approval.

1. The Rev. 0 Submittal will reflect Contractor's plan for the Work as awarded in full accordance with the Contract, and will not include any delays, changes, Change Orders, Construction Change Directives or substitutions, or "or-equals". Activity durations and Work sequences in the CPM Schedule Rev. 0 Submittal will be based on furnishing named or specified materials/equipment nominated in the Contract and the means and methods indicated in or required by the Contract Documents. No activity durations or Work sequences in the Rev. 0 CPM Schedule will be based on or-equals or substitutions even if the Contractor intends to pursue such under the provisions of the Specifications. Any additional modifications to the contract dates, scope, or costs are managed through approval of subsequent CPM Schedule Submittals.

2. Contractor will cause Work covered by Allowances as well as specified Unit Price Work and contingent Unit Price Work to be done within the Contract Times. Contractor will be responsible for completing, within the Contract Time for Substantial Completion, up to one hundred twenty-five percent (125%) of the estimated quantities for each specified item of Unit Price Work. The CPM Schedule will incorporate within the limits of the Contract Times:

   a. Contractor's best estimate of the activities and logic ties required by Cash Allowances and Work to be authorized under any Provisionary Allowances and under any contingent Unit Price Work; and,

   b. Activities relating to requisite tasks of Owner, and to interfaces with other work, based on the information given in the Contract Documents, and if not given, as indicated by the Engineer. Provisionary Allowance activity will be for the entire duration of the Contract. In any case, Contractor will allow not less than the times indicated in the Contract, or if no times are indicated, 15 days or such greater time as is reasonable under the circumstances for each required action by Engineer, Owner or other contractors.

   c. The Rev. 0 schedule will allow sufficient time to accommodate Owner activities as well as time for facility operational constraints that may affect the ability to obtain equipment shutdowns. Required durations for Owner submittal review will be not less than those referenced in Section 01 33 00 - Submittal Procedures.

   d. Planned durations for weather-exposed activities will include sufficient time allowances to accommodate without delay the loss, within each calendar month, of not less than the number of work-days specified below due solely to adverse weather.

Monthly Required Allowance for Workdays Lost Due to Adverse Weather											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

5	5	5	6	6	6	8	5	8	4	5	4

No extension in Contract Time will be justified due to adverse weather except to the extent that the number of work days lost in a calendar month due solely to adverse weather exceeds the number of days specified in the table above.

3. Contractor will cost and resource load the activities within the CPM schedule by allocating to each activity the applicable portion of the Contract Price proportionate to the Work required to perform the activity. The cost-loaded CPM Schedule will tabulate schedule activity number, quantities (for Unit Price Items), required craft labor hours, and activity cost value for each activity. Contractor may add non-work activities to the CPM schedule as necessary to account for all elements within the total Contract price. Activities for submittals and other non-construction activities (excluding mobilization and design deliverables under design/build delivery) will not be cost-loaded within the CPM Schedule. Activities for bonds, builders risk insurance and stored materials will be cost loaded at invoiced cost (excluding any general conditions, overheads or profit). The cost-loaded schedule will include activities and costs for specific deliverables within the following categories:

    a. CPM schedules; (b) testing, start-up, commissioning; (c) operation and maintenance manuals; (d) training; (e) delivery of updated as-built record documents; (f) clean-up, and (g) punch list work for each trade or subcontractor in an amount not less than 1% of the total Work of that trade or subcontractor. The aggregate total of all activity costs within the cost-loaded schedule will equal the Contract Price. Delivery activities will be cost loaded if the Contractor intends to request payment for materials properly stored on-site. Costs shown for each activity in the cost-loaded CPM Schedule will reflect a share of the Contract Price that is proportionate to the estimated costs to perform the associated Work, including a proportional share of Contractor's and subcontractor’s mark-ups, and will be an accurate and correct allocation of the Contract Price.

    b. testing, start-up, commissioning;

    c. operation and maintenance manuals;

    d. training;

    e. delivery of updated as-built record documents;

    f. clean-up, and

    g. punch list work for each trade or subcontractor in an amount not less than 1% of the total Work of that trade or subcontractor.

4. The aggregate total of all activity costs within the cost-loaded schedule will equal the Contract Price. Delivery activities will be cost loaded if the Contractor intends to request payment for materials properly stored on-site. Costs shown for each activity in the cost-loaded CPM Schedule will reflect a share of the Contract Price that is proportionate to the estimated costs to perform the associated Work, including a proportional share of Contractor's and subcontractor’s mark-ups, and will be an accurate and correct allocation of the Contract Price.

5. Unless otherwise approved by the Engineer activity cost amounts within the cost-loaded schedule will be summarized into payment items comprising a Detailed Cost Breakdown

(DCB) to be used to prepare Progress Payment Estimates. In such case each schedule activity will be cross-referenced to one and only one summary payment item through assignment of a payment item code. A single DCB payment item may include one or more schedule activities. The aggregate total of all DCB payment items will equal the Contract Price. Separate DCB items and cost-loaded schedule activities will be provided for furnishing, installing and testing of equipment.

6. The cost-loaded CPM Schedule and DCB will be submitted for Engineer's review and approval in accordance with the requirements of the General Conditions and will:

    a. show the allocation of the Contract Price among activities representing the various components of the Work, in sufficient detail as the Engineer may require;

    b. divide the Work into activities by significant Sections of the Specifications within areas, structures and Facilities, or Work Breakdowns, or vice versa;

    c. identify total amounts for each Work activity;

    d. segregate work by the various subcontractors and identify the subcontractor performing each element of the work; and

    e. for Unit Price Items only, tabulate quantities and unit prices.

7. Contractor will hold a baseline schedule presentation meeting for the Owner and Engineer. This meeting is meant for the Contractor to present, in detail, the schedule plan.

    a. Examples of items for presentation include but are not limited to work breakdown structure, a description of each activity name, basis for durations, general work sequence, the critical path, and weather assumptions. This meeting could also take place during schedule updates, if requested.

8. **The first Progress Payment will not be finalized until the Engineer returns to the Contractor the Rev. 0 CPM Schedule Submittal (including the DCB) as "Approved" or "Approved As Noted."** Once the Rev. 0, or Rev. 0A, etc. CPM Schedule Submittal is returned by the Engineer as "Approved" or "Approved As Noted", it will represent the As-Planned Schedule, and will be used for Payment Submittals until revisions to the CPM Schedule are approved by the Engineer. If Engineer does not approve the cost-loaded CPM Schedule or the DCB, Contractor will address Engineer's comments, revise and resubmit until approved by the Engineer. The cost-loaded CPM Schedule report and the DCB will include spaces for signatures of Engineer and Contractor to confirm the approval of each party. Once the Rev. 0 cost-loaded CPM Schedule and DCB are approved, the Contractor will not modify any activity value or pay item, unless otherwise authorized by the Engineer in writing. Engineer may require reallocation of costs for uninstalled material, amounts not expended for bonds or insurances, or to properly reflect authorized Change Directives or Change Orders. Contractor represents and warrants to Owner that the final cost-loaded CPM Schedule and DCB provide an accurate and correct allocation of the Contract Price.

9. CPM Schedule Updates. After approval of the Rev. 0 CPM Schedule Contractor will update the CPM Schedule monthly (or at shorter intervals if deemed necessary by the Engineer) using as a data date the first day of each calendar month. Each CPM Schedule Update will show the actual status of the Project as of the date of the updated CPM Schedule. CPM

Schedule Updates will progress the Record Schedule, and will be due five (5) days after the closing of each Progress Payment period, whether the As-Planned Schedule has been established or not. Each CPM Schedule Update submittal will be accompanied by the following power point slides in a format acceptable to the Engineer: (1) Project milestone date trending; (2) Summary schedule; (3) Project activity progress (number of activities earlier or later than scheduled last month); (4) Project total float (mean and median total float trend each month); (5) Labor hour resources planned loading each month; and Actual Labor Count weekly history (from daily reports).

a. Each update will include the actual dates each activity is commenced and the date that the activity is completed sufficiently to allow subsequent activities to commence, delays and other significant events occurring since the previous Payment Submittal.

b. Contractor may revise schedule logic in each CPM Schedule Update provided that such revisions comply with Contract requirements, are identified in the accompanying narrative, and are acceptable to Engineer. Schedule logic and/or activities will be revised as necessary to accurately address out-of-sequence progress (e.g., successor activities started before completion of predecessor).

c. Subject to review and approval of Engineer, Contractor will update the physical percent complete for each activity started or in progress, based on realistic assessment of earned value and work remaining. Contractor will revise percent complete as required by Engineer. Activities which are complete but for remaining minor punch list work and which do not restrain the initiation of successor activities may be declared 100 percent complete. Punch list activities may be declared 100 percent complete upon completion and correction of punch list work identified during Owner’s pre-final inspection.

d. Contractor will include the CPM Schedule Update with its monthly Payment Submittal, which will also include Contractor’s certification that it has not been delayed or adversely impacted, as of the cut-off date, by any acts or omissions of Owner or Engineer, except as otherwise specifically stated.

e. The most recent CPM Schedule “Approved” or “Approved as Noted” by the Engineer will be the current Record Schedule and will be used by the Owner and Contractor to monitor progress against Contract Times and resolve issues affecting Contract Prices and Contract Times and the assessment of liquidated damages.

f. If the Early Dates in any CPM Schedule update submittal forecast any slippage in the Contract Times, the Contractor will indicate such overrun(s) by reporting negative Total Floats. Owner reserves the right not to approve schedules that do not reflect completion within the Contract Time.

10. Short-term look-ahead Schedules will subdivide CPM Activities into detailed tasks and cover the prior two (2) weeks and the next four (4) weeks. Each installation task will be cross- referenced to a CPM Activity and will not combine the Work for more than one crew.

11. Submittals will segregate preparation from review and will not combine items furnished by separate Suppliers.

1.05 CONTRACTOR'S SCHEDULER

A. Contractor will appoint a project scheduler with the following minimum qualifications (unless otherwise modified by the Owner or Engineer): At least 5 years of experience using a recent version of Primavera P6 Professional Project Management software, and scheduling for at least three construction projects with cost and responsibility loaded CPM schedules. If the appointed project scheduler fails to perform to an adequate professional and technical standard or if Engineer, in the reasonable exercise of its discretion, objects to the appointed project scheduler, the Contractor will use a replacement project scheduler having the required qualifications, at no increase in Contract Price and/or Contract Time. Submit the scheduler qualifications and experience for Engineer review and approval.

B. Contractor's scheduler will prepare the Baseline schedule, all schedule updates, look ahead schedules, time impact analysis, and recovery schedules required by the Contract Documents. Contractor's scheduler will attend all project meetings where scheduling input is necessary, as well as attend the meetings and perform the duties set out in the other Contract Documents. Owner and Engineer will be invited to all Contractor Scheduling meetings.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PROGRESS AND COMPLETION

A. Time limits stated in the Contract Documents are of the essence of the Agreement. Contractor will begin the Work on the date of commencement indicated in the Notice to Proceed. It will carry the Work forward expeditiously with adequate resources, will at all times adhere to the CPM Schedule, and will achieve Substantial Completion and Final Completion within the time limits set forth in Project Calendar stated in the Contract Documents, as extended by change orders.

B. The construction and completion of the Project will be undertaken and completed in accordance with the cost loaded CPM Schedule described in the Contract Documents. The parties will use the CPM Schedule for planning and monitoring the progress of the Work. If the Contractor will fail to adhere to the CPM Schedule, as revised pursuant to the Contract, it must promptly request Engineer's approval to work outside of normal working hours and will work such additional time over regular hours, including Saturdays, Sundays and holidays and/or supply such additional workmen as may be required to bring the Work on schedule, without additional cost or expense to Owner, including claims for inefficiency due to the use of overtime. In the event of such failure of Contractor to adhere to the CPM Schedule, Contractor may alternatively propose revisions to the CPM schedule to recover the delay for Engineer 's review and approval. If Engineer agrees that such revisions are feasible and likely to recover the delay, Contractor will promptly implement the measures necessary to recover the delay.

C. If Contractor is late in achieving Substantial Completion, Final Completion, or if Contractor fails to adhere to the approved CPM Schedule or submits a CPM Schedule update which forecasts delay in achieving any of the Contract Times, or if Engineer reasonably determines based on an evaluation of Contractor's rate of progress that there is a substantial probability of delay in achieving any of the Contract Times, Engineer may provide Contractor a notice to cure, request that Contractor submit a schedule recovery plan, and withhold liquidated damages in accordance with the applicable provisions of the Agreement.

D. Upon receipt of a request for a schedule recovery plan:

1. To the extent that Contractor believes that it is entitled to an increase in Contract Time under the terms of the Contract, Contractor will comply with paragraphs 3.02 and 3.03 in providing notice, demonstration of entitlement, delay analysis, and supporting documentation demonstrating the number of days of Contract Time extension to which Contractor believes it is entitled.

2. To the extent that delay exceeds any time extension to which Contractor is entitled, Contractor will submit a schedule recovery plan and immediately take measures necessary to recover delay. Contractor's schedule recovery plan will describe the cause of schedule slippage or delayed progress and the actions proposed and taken by the Contractor to recover schedule. Contractor will meet with the Engineer and present the Contractor's written schedule recovery plan. If, upon evaluation of the Contractor's schedule recovery plan, the Engineer determines that there is sufficient cause to withhold liquidated damages, the Owner may deduct from Requests for Payment the Owner's estimate of the liquidated damages then due using the Engineer's estimate of late completion of the Work.

E. Contractor will carry on the Work with due diligence during all disputes or disagreements with the Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements. Contractor will exercise reasonable precautions, efforts and measures to avoid or mitigate situations that would cause Delays.

3.02 SUSPENSIONS AND DELAYS

A. In accordance with the General Conditions the Engineer may order the Contractor in writing to suspend, defer, stop, delay, interrupt, slow down, or extend all or any part of the Work for such period as it may determine to be appropriate for the convenience of Owner.

1. To the extent practical, the Contractor will consult with Engineer and will mitigate the cost of suspensions and delays by reducing the size of its Project staff and demobilizing equipment to the extent practicable upon notice from the Engineer of any Owner caused delay or interruption which is likely to exceed seven (7) days. Upon the termination of the delay or as otherwise directed by Owner, the Contractor will restore the Project staff to the appropriate size.

B. Contractor will provide Owner the opportunity to prevent or mitigate delays by Contractor's promptly furnishing of written notice of potential delay to Engineer before Contractor incurs actual delay or additional costs, and in any case not later than three (3) days after the occurrence of any of the following that Contractor believes: (a) to be within the responsibility of the Owner, and (b) may result in critical path delay to any of the Contract Times required by the Project Calendar included in the Contract Documents:

1. (i) Construction Change Directives or Change Orders issued by Owner; (ii) the Contractor receives a notice of a change in the Agreement or extra work to be performed; (iii) the Engineer provides a clarification or notice of a no-cost change or minor change as provided in the General Conditions; or (iv) Owner or Engineer directs a change in the Work in accordance with the changes provisions of the General Conditions that Contractor believes will result in critical path delay to any Contract Time;

2. Contractor encounters concealed conditions in accordance with the provisions of the General Conditions that it believes will result in critical path delay to any Contract Time;

3. Contractor believes that any act or failure to act by Owner or Engineer or any of Owner's other contractors or consultants, or any variation in quantities for unit price work, will cause performance of all or any part of the Work to be delayed, deferred, stopped, slowed down, suspended or interrupted beyond the reasonable time for such actions as allowed under the Contract Documents and the CPM schedule, resulting in potential critical path delay to any Contract Time.

C. Contractor will promptly provide written notice to Engineer before Contractor incurs actual delay or additional costs, and in any case not later than three (3) days after the occurrence of any event that (a) is not within the responsibility of either the Owner or the Contractor, and (b) may result in critical path delay to any Contract Time including without limitation:

1. Uncontrollable Circumstance as provided in the General Conditions

2. Adverse weather within a calendar month that causes the loss of more work-days than specified herein.

3. Conditions affecting Owner's facilities, that result in constraints to Contractor's work or impede shutdowns of Owner's systems at the times requested by Contractor, including without limitation operational effects of weather, plant conditions, ongoing maintenance, other work affecting available facilities, equipment failures or outages, requirements to maintain sufficient processing capacity, or other regulatory or operational issues affecting Owner's facilities, provided that such conditions are outside the reasonable control and reasonable advance planning of both Owner and Contractor.

4. Delays caused by regulatory authorities, governmental agencies, public utilities, and other third parties.

D. Contractor will promptly provide written notice to Engineer, in any case not later than three (3) days, after the start of any delay that is within the responsibility of the Contractor and will immediately take such action as is necessary to mitigate and recover the delay.

1. Contractor will provide notice and promptly take appropriate action to recover schedule whenever the Contractor anticipates, or any CPM Schedule Submittal demonstrates, that the scheduled early completion date for any required CPM Activity has slipped, due to acts or omissions within the control of the Contractor, beyond any Contract Time. If the Contractor is not responsible for such schedule slippage, the Contractor will give prompt written notice of a delay justifying a Contract Time extension in accordance with paragraph 3.02.B or 3.02.C.

2. If schedule recovery is required, the Contractor will enclose with the next Schedule Update Submittal a schedule recovery plan consisting of (a) a narrative describing the cause of schedule slippage and the actions taken to recover schedule within the shortest reasonable time, and (b) a Recovery Schedule with the corresponding revisions in Activities and logic ties and other adjustments intended to recover the schedule. Appropriate schedule recovery actions may include: assignment of additional labor, Subcontractors or construction equipment; Work during other than normal working hours; resequencing of the Work; increasing the concurrency of sequential Work activities; expediting of Submittals and deliveries; and any combination of any of these or other similar actions. Activity shortening and overlapping will be explained as to their basis (and be supported by increases in resources).

3. Contractor's failure, refusal or neglect to take appropriate schedule recovery action or, in the alternative, give written notice of a delay with a timely and properly supported Time extension request, and, in either case, to follow up with a timely CPM Schedule will be reasonable evidence that the Contractor is not prosecuting the Work with due diligence. Any such Contractor failure, refusal or neglect will give sufficient basis to the Owner, to elect any of the following:

    a. demand adequate, written assurance of due performance, as provided in the General Conditions,

    b. withhold liquidated damages, and

    c. in the Owner's sole discretion, direct alternate schedule recovery actions.

E. Each Subcontractor will be bound by the foregoing provisions.

3.03 DELAYS AND EXTENSIONS OF TIME

A. Extensions of the Contract Time will not be granted except as expressly provided for in the General Conditions and this Specification Section.

B. If the Contractor determines that critical path delay will occur to any Contract Time due to the events identified in paragraphs 3.02.A, 3.02.B or 3.02.C, Contractor may request a commensurate adjustment in the affected Contract Times (but only to the minimum extent reasonably forced on the parties by the event) by submitting to the Engineer a properly supported written request for extension of Time no more than three (3) days after Contractor provides notice of a concealed condition as provided in the General Conditions, or the extent of the delay becomes known, or the Engineer requests such submittal, whichever is sooner, or if the delay continues for more than 30 days, submit requests for Time extension at 30 day intervals until the delay has ended. Requests for Time extension in connection with weather delays will be made on a monthly basis within three (3) days from the end of each month. Claims for adjustment in any of the Contract Times or Contract Price will be waived if not properly submitted in accordance with all requirements of the General Conditions and this Specification Section within the time limit required or if timely notice of delay was not submitted in accordance with paragraphs 3.02.A, 3.02.B or 3.02.C.

C. No extension in Contract Time will be justified unless the Contractor demonstrates, through a detailed analysis of the CPM Schedule using the procedures specified in this paragraph 3.03, the occurrence of Delay which (a) is not reasonably foreseeable under the circumstances, (b) arises from unforeseeable causes, (c) is not caused in whole or in part by any act or omission within the control of the Contractor, and (d) necessarily extends the Work beyond the overall Contract Time (or a portion of the Work beyond a pertinent Contract Time).

D. Properly supported requests for extension of Time will include:

1. Explanation of the cause and duration of the delay together with identification of which schedule activities were affected.

2. Justification for entitlement to a time extension under the Contract Documents.

3. Identification of all concurrent delays with an explanation of their causes and which party is responsible for each.

4. Critical path analysis, using the latest Record Schedule approved by the Engineer before the start of the delay, demonstrating the number of calendar days by which each of the Contract Times has been delayed due to each cause. Analysis will be accompanied by native electronic XER files and will be verifiable by an independent, objective evaluation by the Engineer, using the electronic files and data furnished by the Contractor. Unless otherwise required by the Engineer, prospective analysis wil be prepared in accordance with AACEI Recommended Protocol RP-29, method implementation protocol MIP-3.6 (“Modeled / Additive / Single Base”) and as specified herein, by using the most recent Engineer approved Record Schedule prior to the date that the delay commenced, incorporating any schedule review comments provided by Engineer, then updating the schedule with actual progress to the start of the delay and noting the updated dates calculated for achievement of each of the Contract Times before commencement of the delay.

    a. Modeling of each delay will be accomplished by inserting into the updated pre- delay Record Schedule appropriate activities for each delay, with duration, constraints and logic accurately reflecting the actual delay and its impact on other activities.

    b. If more than one delay is concurrently in progress at any time after the start of the delay the analysis will be conducted in the following sequential steps:

        1) Delays under paragraph 3.02.C will be incorporated into the schedule that also includes the delays under paragraph 3.02.D, a copy of the schedule preserved, and resulting dates calculated for achievement of each of the Contract Times will be noted to determine the extent of delays that are not within the responsibility of the Owner.

        2) Using the same schedule containing all delays that are not within the responsibility of the Owner, all delays under paragraphs 3.02.A and 3.02.B will then be incorporated into the schedule, a copy of the schedule preserved, and the resulting further extension evaluated based on the dates calculated for achievement of each of the Contract Times.

    c. Reasonable delay mitigation to the extent commercially practicable will be incorporated into the schedule containing all delays by revising or deleting non- mandatory schedule logic, and increasing activity concurrency where practicable, and noting the resulting dates calculated for achievement of each of the Contract Times reflecting the effects of all schedule delays and commercially practicable mitigation.

    d. Extensions for each of the Contract Times will not exceed the difference in time between the dates calculated under paragraph 3.03.D.4.c and those calculated under paragraph 3.03.D.4.b.1.

    e. Unless otherwise required by the Engineer, retrospective delay analysis will be prepared in accordance with AACEI Recommended Protocol RP-29, method implementation protocol MIP-3.9 (“Modeled / Subtractive / Multiple Base”)

E. Engineer may perform or obtain an independent evaluation of delays. Engineer will review timely submitted, properly supported, requests for extension of Time and will determine the extent to which each of the Contract Times is to be revised by Change Order.

F. Minor Delays: No adjustment in any of the Contract Times will be justified as a result of (a) any delay of less than twenty-four (24) hours duration, or (b) delays to activities that are not on the critical path controlling the calculated date for achievement of any of the Contract Times, or (c) Contractor's failure to allow sufficient time in schedules in accordance with contract requirements.

G. No adjustments to the Contract Price or Contract Time will be made under the provisions of the General Conditions or this paragraph 3.03 for any suspension, delay or interruption (i) to the extent that performance would have been so suspended, delayed or interrupted by any other cause, including the fault or negligence of the Contractor; or (ii) for which an equitable adjustment is provided or excluded under any other provision of the Agreement. Further, no suspension of Work or delay will justify an increase in Contract Price or Contract Time unless the resulting Delay exceeds the time allowed in the Contract Documents for the act or failure to act.

H. To the extent that compensation for delays is permitted under the General Conditions, for critical path delays to any of the Contract Times due solely to the causes specified under paragraph 3.02.A or 3.02.B, and to the extent that the Work would not have been delayed due to any cause not within the responsibility of the Owner, Contractor may include in its timely properly supported requests for extension of time a Request for Change Order in accordance with the applicable provisions of the Contract General Conditions requesting compensation for additional costs incurred solely due to such critical path delays. However, no request or claim by the Contractor under this paragraph 3.03.H for an adjustment in Contract Time or for compensation for additional costs will be allowed (a) for any Delay or costs incurred more than three (3) Days before the Contractor gives written notice (except for Engineer's written orders to Contractor provided under the provisions of the General Conditions), or (b) if made after final payment. Delay for which compensation may be requested will be calculated as the difference between the dates for achievement of the Contract Times for Substantial Completion and for Final Completion calculated under paragraph 3.03.D.4.c and those calculated under paragraph 3.03.D.4.b.2. Compensation for such delays will be calculated in accordance with the General Conditions and applicable Specification Sections.

I. Owner's exercise of any of its rights under the Agreement and its Contract Documents, including requirement of correction or re-execution of the Work, regardless of the extent, number or frequency of Owner's exercise of such rights or remedies, will not under any circumstances be construed as interference with the Contractor's performance of the Work or as providing grounds for the Contractor to seek extensions of Contract Time or damages for delay of the Project.

J. Extension of the Contract Time will be the Contractor's sole remedy for any delay due to any of the causes identified under paragraph 3.02.C. In no event will the Contractor be entitled to any compensation or recovery of any damages in connection with any delay under paragraph 3.02.C, including, without limitation, extended overheads, extended general conditions, consequential damages, lost opportunity costs, impact damages or other similar remuneration.

K. For delays due to any of the causes identified under paragraph 3.02.D, or for acceleration to overcome such delays, Contractor will not be entitled to any increase in Contract Price and/or Contract Time, and the Contractor will assume all resulting direct, indirect and consequential costs, of both the Owner and Contractor.

L. If Contractor fails to complete the Work within any of the Contract Times due to delays within the responsibility of the Contractor, Owner may in its sole discretion (a) proceed to terminate the Contract for cause in accordance with the provisions of the General Conditions or (b) unilaterally issue a Change Order that both increases the Contract Time to the extent that Engineer determines necessary for completion of the Work, and provides a commensurate reduction in the Contract Price calculated as the cumulative total of the product of the number of days by which each Contract Time is extended due to delay within the responsibility of the Contractor times the daily liquidated damage rate that would have been applicable under the Contract had the Contract Time not been extended; or (c) execute a bilateral Change Order mutually agreed upon between Owner and the Contractor, to extend the Contract Time and compensate Owner for its damages; or (d) exercise any other rights available to the Owner under the Contract or by law or equity. If a Change Order or Construction Change Directive results in reduction of the Contract Price to an amount less than the cumulative total paid by Owner, Contractor will provide to the Owner a cash refund of the excess amount paid.

M. To the extent that the Owner authorizes (a) changes in the Work or (b) agrees to changes in Contract-required constraints or sequences, or (c) takes other actions that result in critical path reductions in the Time required to perform the Work, Owner will be entitled to commensurate reductions in the Contract Time and the Contract Price, or alternatively, if so directed by the Engineer, a period of Owner’s float may be incorporated into the CPM Schedule for the Owner’s exclusive use to mitigate delays within the responsibility of the Owner. Owner will provide notice to Contractor together with a critical path schedule analysis demonstrating the extent of reduction in any of the Contract Times, or the quantum of Owner’s float created.

N. Notwithstanding anything contained herein to the contrary, Contractor acknowledges that no extensions of the Contract Time or increase to the Contract Price will be permitted except as approved in advance by Owner's execution of a Change Order in accordance with the executed Contract.

O. Each Subcontractor and supplier/vendor will be bound by the foregoing provisions.

3.04 ACCELERATION OF PERFORMANCE

A. Owner may direct acceleration of performance in accordance with the provisions of the General Conditions. Upon receipt of a written order from the Engineer directing acceleration of performance for the Owner’s convenience, Contractor will consult with the Engineer regarding measures available to accelerate the work and will take such measures as the Engineer will direct, including for example resequencing of the CPM schedule, increasing concurrency of activities, increasing staff, accelerating submittals and material deliveries, and employing overtime work as so ordered.

B. If Contractor believes that schedule recovery is necessary due to delays that are not within the responsibility of the Contractor, the Contractor will provide prompt notice and a request for Time extension in accordance with paragraphs 3.02 and 3.03. Before acting to accelerate the work, Contractor will furnish to Engineer a written notice of planned acceleration specifying the actions that Contractor intends to take and the reasons therefor. Owner will bear no responsibility for costs incurred by the Contractor for schedule recovery efforts:

1. before providing such notice to the Engineer; or

2. to the extent of delays that are within the responsibility of the Contractor.

In any case, when performing efforts to recover delays that Contractor believes are the responsibility of the Owner, Contractor will maintain cost records in accordance with applicable requirements of the General Conditions and will submit for Engineer's signature daily time sheets showing overtime premiums paid. To the extent that Contractor demonstrates to Engineer's satisfaction that

1. Contractor had timely submitted a request for Contract Time extension justifying an extension of Time;
2. an extension of Time was justified under the Contract but not granted by Owner;
3. that the cause of the delay was not mitigated;
4. Contractor provided notice as specified before undertaking acceleration; and
5. that Contractor incurred additional overtime costs to accelerate its Work solely to recover such delay, Owner will reimburse as additional compensation only the premium cost of such overtime work, as shown on the time slips checked and approved each day by the Engineer, and no overhead, profits, costs, commissions, claims for inefficiencies or otherwise, or other costs or claims will be charged or due with respect to use of overtime work or the acceleration of performance.

C. Each Subcontractor will be bound by the foregoing provisions.

3.05 USE OF FLOAT

A. Total Float and Contract Float, whether expressly disclosed or implied by the use of float suppression techniques, are not for the exclusive benefit of the Contractor or Owner and will be available to both the Contractor and Owner.

B. The amount of Total Float available for sharing by the Owner will not be artificially reduced through the Contractor's unreasonable use of float suppression techniques. Total Float hidden using such techniques as preferential sequencing, late starts of follow-up trades, small crews, extended durations, imposed dates, scheduling Work not required for a Contract Time as if it were required Work, and so forth will be Total Float otherwise available for sharing with the Owner.

C. If the Engineer determines that the Contractor is utilizing unreasonable float suppression techniques and preferential sequencing (including, but not limited to late starts of follow-on trades, unreasonably small crews, extended durations, imposed dates, or scheduling Work not required) in violation of the float sharing provisions of the Contract Documents, the Contractor will not be entitled to any changes in Contract Price or Contract Time.

D. Early Completion Schedules: Contractor's bid and the Contract Price will be premised upon completion exactly on the Contract Time, without any contemplation of early completion. Contractor will not have a right to finish early. Submittal of a CPM Schedule having an early completion date for any Contract Milestone that is before the corresponding Contract Time will constitute Contractor's agreement that all days between the scheduled early completion date and the Contract Time constitute contract float available to both parties to absorb delays that occur due to any cause. Delays that do not extend the Work beyond the Contract Time will not justify an extension of Contract Time nor will the Owner have any liability under any circumstances for any delay from a planned early completion date.

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 STAKING SCHEDULE

A. Submit one (1) electronic copy in PDF format of the Staking Schedule, in accordance with Section 01 71 23 - Construction Layout prior to the start of construction.

1. Provide updated Staking Schedules to the Engineer through completion of the Work.

1.06 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.

1.07 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.

1.08 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.

1.09 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.

1.10 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.

1.11 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.

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.

1.12 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.

1.13 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.

1.14 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. Owner will have the authority to designate areas for which coverage may be added or omitted. The audio/video recording will be done prior to placement of materials or equipment on the construction area and furnished one (1) week prior to the pre-construction meeting.

C. Format:

1. Audio/Video route survey will be submitted in the format(s) as specified in Section 01 11 00.

a. Audio/video route survey submission will be on USB media

b. Format: USB – Video

c. Video Encoding: Highest available bit rate (6-9 Megabit), 60 fields per second interlaced video

d. Audio Encoding: Uncompressed stereo wave or stereo Dolby Digital (256 kilobit or better)

e. Aspect Ratio: 4x3 (720x480 pixels)

f. No Macrovision or other copy protection encoding. No region code or region code 1.

D. Complete coverage will include surface features located within the public right-of-way, easement areas and adjacent private properties up to building line when such properties lie within the zone of influence of construction and will be supported by appropriate audio description made simultaneously with video coverage. Such coverage will include, but not be limited to, existing driveways, sidewalks, curbs, ditches, roadways, landscaping, trees, culvert, headwalls, retaining walls, and buildings located within such zone of influence. Video coverage will be clear enough to identify cracks, depressions, holes and other defects in existing surfaces.

E. Houses and buildings will be identified visually by house number, when visible, in such a manner that structures of the proposed system can be located by reference. In all instances, however, location will be identified by audio or visual means at intervals not-to-exceed 100 linear feet (30 m) in the general direction of travel.

F. When conventional wheeled vehicles are used, the distance from the camera lens to the ground will be not less than 12 feet (3.5 m) to ensure proper perspective. The rate of speed in the general direction of travel of the conveyance used during recording will not exceed 30 feet/minute (10 m/min). Panning rates and zoom-in, zoom-out rates will be controlled sufficiently such that stop action during play-back will produce clarity of detail of the object viewed.

G. Video recordings must, by electronic means, display continuously and simultaneously generated transparent digital information in the upper left hand third of the screen to include the date and time of recording, as well as the corresponding engineering stationing numbers as shown on the Contract Drawings.

1. The date information will contain the month, day, and year. For example, mm/dd/yy, and be placed directly below the time information.

2. The time information will consist of hours, minutes, and seconds, separated by colons. For example, hh:mm:ss.

H. Engineering stationing numbers must be continuous, accurate and correspond to the Project stationing and must include the standard engineering symbols. For example, Station 14+84.

I. Recording will be done during times of good visibility. No recording will be done during periods of visible precipitation, or when more than ten (10) percent of the ground area is covered with snow or standing water, unless otherwise authorized by the Owner.

J. In some instances, audio/video coverage may not be suitable for recording necessary details. In such instances, the Owner may specify still photographs to provide coverage. One (1) color photograph will be provided in accordance with this Section with a suitable description of the photograph’s location.

K. Any portion of the Audio/Video Route Survey of insufficient quality as determined by the Engineer will be redone by the Contractor at no additional cost to the Owner.

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

1.15 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 the Engineer in accordance with the methods designated by the Specifications. Contractor will furnish such facilities as the Engineer may require for collecting, storing, and forwarding samples to the Laboratory. Contractor will furnish the required samples to the Owner without charge.

1.02 TESTS OF MATERIALS

A. Materials in the Work will meet the requirements of the Contract Documents.

B. Tests of materials will be made as specified herein. 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 Owner. In any case materials may be either inspected or tested when received on the Project.

C. Materials will not be used until approval has been received from the Engineer. Approval of materials at the producing plant does not constitute a waiver of the 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 the Engineer.

1.03 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.

1.04 SOURCE QUALITY CONTROL

A. Testing identified in the Contract Documents for quality control, which is required to establish quality of materials, equipment or fabricated items, will be paid for by the Contractor unless otherwise noted.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SITE ACCESS AND PARKING

A. Contractor will locate roads, drives, walks and parking facilities to provide uninterrupted access to construction offices, mobilization, Work, storage areas, and other areas required for execution of the Contract. Access drives and parking areas will be hard surfaced unless otherwise approved by the 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 Owner.

1.04 PRIVATE OR PUBLIC ROADS, SIDEWALKS, AND PARKING AREAS

A. Where public roads, driveways, parking areas and sidewalks are encountered throughout the community, the Contractor will maintain those portions affected by the construction operations in a passable condition until such time as final restoration of these improvements can be made as specified.

1. If, in the opinion of the 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 Owner to issue a stop Work order, which will remain in effect until all necessary devices are in place and operational. The issuance of a stop Work order will not be reason for granting additional compensation or an extension to the Contract Time.

2. Furnishing, installing, and maintaining traffic control devices will be incidental to the Project unless otherwise provided for in the Proposal.

1.08 EXISTING SIGNS

A. No stop sign, traffic control or warning device or sign will be taken down until the agency having jurisdiction over the roads has been notified and arrangements for the immediate reinstallation has been made. Contractor will provide temporary signs, traffic control devices, warning devices, or watchmen continuously from the time the item is removed until it is reinstalled. Signs removed will be replaced with signs meeting requirements of the agency having jurisdiction over the roads.

1.09 TEMPORARY ELECTRICITY AND LIGHTING

A. Contractor will be responsible for and pay all costs for the installation and removal of circuit and branch wiring, with area distribution boxes located so that power and lighting is available throughout the construction by the use of construction-type power cords and will pay all costs of electrical power used.

B. Electrical wiring and distribution will conform to the National Electrical Code as adopted by the State of Michigan.

1.10 TELEPHONE

A. Contractor is required by MIOSHA regulations to provide telephone service for contacting emergency services. Such emergency telephone service will also be available for the use of the Owner and 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 Owner 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 Owner 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 Owner 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.

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 51 18 - TEMPORARY WATER MAIN

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes construction of temporary water main and water service connections to existing homes to supply water while the existing water main is out of service as a contingency for pipe bursting, hoizontal directional drilling, or other water main renewal/replacement.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 89 00 - Site Construction Performance Requirements

B. Section 31 23 33 - Trenching and Backfilling

C. Section 33 14 00 - Water Utility Distribution Piping

1.03 REFERENCE STANDARDS

A. ASTM B88 - Standard Specification for Seamless Copper Water Tube

B. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)

C. ASTM D3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

D. ASTM F477 - Standard Specification For Elastomeric Seals (Gaskets) For Joining Plastic Pipe

E. ASTM F1055 - Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing

F. AWWA C651 - Disinfecting Water Mains

G. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm)

H. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 3/4 In. (19 mm) Through 3 In. (76 mm), for Water Service

I. AWWA C906 - Polyethylene (PE) Pressure Pipe and Fittings, 4 In. through 65 In. (100 mm through 1650 mm), for Waterworks

J. NSF/ANSI 14 - Certification of Plastic Piping Products

K. NSF 61 - Drinking Water System Components - Health Effects

L. AWWA M28 Water Pipeline Rehabilitation

1.04 SUBMITTALS

A. Submit shop drawings, catalog data, and manufacturer’s technical data showing complete information on the materials, specifications, composition, physical properties, and dimensions of pipe and fittings.

B. Submit detailed drawings showing detail and written descriptions of methods of connections of temporary water main to fire hydrants, use of RPZ's, and connection temporary water services to houses. Include entire construction process, disinfecting, testing, protection of piping (particularly at road/driveway/crossings), timing sequence, and related Work.

1.05 QUALITY ASSURANCE

A. Polyethylene pipe jointing will be performed by personnel trained in the use of butt-fusion or electro-fusion equipment and recommended methods for new pipe connections.

1.06 COORDINATION

A. Owner will locate and mark water service curb stops along the route of the temporary water main.

B. Verify operation of each curb stop prior to beginning work. When authorized by Engineer, remove and replace, or repair, existing curb stops and/or curb boxes as necessary to complete the Work. _____

1. If curb boxes are plugged with dirt, broken, or misaligned in such away that the curb stop can not be accessed and turned, remove curb box and reset.

2. If curb stops are inoperable, remove and replace existing curb stop with a new curb stop.

C. Coordinate with Owner, Engineer, and local Fire Department at least 24 hours prior to shutting down existing water main.

1.07 DESIGN REQUIREMENTS

A. Temporary water main will be PVC or Polyethylene pipe unless otherwise approved by Engineer.

B. Temporary water main will be of the minimum diameter as specified below:

1. 2-inch diameter for systems with 10 or less residential connections (3/4-inch).

2. 4-inch diameter for systems with 50 or less residential connections (3/4-inch).

3. 6-inch diameter for systems with 51 or more residential connections (3/4-inch) but not more than 80 connections.

4. Minimum size of the temporary water main will be upsized as appropriate for services larger than 3/4-inch or more than the maximum allowed number of connections.

1.08 NOTIFICATION

A. Notify Owner and water users affected by the work a minimum of seven days prior to beginning work. Notification will be by means of a written notice on Owner letterhead, delivered to each user by Contractor, and will advise user as to when water service will be interrupted and to minimize water usage during this period. Ensure that every user is so notified. Notification will include telephone number(s) for contacting Contractor at any time, day or night.

B. A second written notice to the water users affected will be provided by Contractor one working day prior to the actual switch over from the existing water main to the temporary water main.

C. Provide a completion notice to each user within 12 hours of restoring water service to the re-lined water main.

PART 2 PRODUCTS

2.01 POLYETHYLENE PIPE

A. Polyethylene pipe will be AWWA C906 high-density polyethylene pipe, minimum Pressure Class 160 (SDR 11). Pipe will be clean and approved for potable water, and meet the requirements of NSF/ANSI 14 and NSF 61.

1. Fittings: Tees, crosses, bends, plugs and corporation stops will be Butt Heat Fusion Type, SDR 11, per ASTM D3261 or Electrofusion Type, per ASTM F1055. Fittings for joining HDPE pipe to Ductile Iron pipe or PVC C900 pipe will be fully restrained, Mechanical Joint Adapters.

2. Pipe Joints: Butt Fusion Welded or Electrofusion Welded. Joints will meet the leakage test requirements of Section 33 14 00 - Water Utility Distribution Piping.

3. Water Service Taps: Electrofusion corporation saddles with 1-inch brass outlet threads and brass corporation stop.

2.02 PVC PIPE

A. PVC pipe will be AWWA C900, restrained joint, PVC plastic, minimum Class 200 (DR 14) or ASTM D2241, SDR 17, restrained joint PVC meeting the requirements of NSF/ANSI 14 and NSF 61. Pipe will be clean and approved for potable water.

B. Pipe Joints: Non-Metallic, restrained joint couplings with high-strength, flexible, thermoplastic spline retainers. Retainers will be inserted into mating precision machined grooves in the pipe and coupling to provide full 360-degree restraint. Couplings will be designed for use at the rated pressures of the pipe and will incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F477. Joints will meet the leakage test requirements of Section 33 14 00 - Water Utility Distribution Piping.

C. Fittings: PVC, AWWA C900, Pressure Class 200 (DR 14).

D. Water Service Taps: Bronze corporation stops with AWWA corporation stop inlet thread and thread outlet compatible with the water service pipe used.

2.03 WATER SERVICE PIPE

A. Water service pipe connecting houses to the temporary water main will be minimum 3/4-inch diameter.

B. Polyethylene, AWWA C901, Pressure Class 125, minimum 1-inch diameter with mechanical restrained fitting.

C. Soft Copper, ASTM B88, Type K, with flared fittings.

D. 1-inch NSF 61 approved hose with brass couplings.

2.04 CURB STOPS AND CURB BOXES

A. Curb stops and curb boxes will be as specified in Section 33 14 00 - Water Utility Distribution Piping.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install temporary water main either above grade or below grade except as outlined below. Above grade pipe including services will be appropriately protected from abuse, damage, vandalism, etc.

B. Temporary water main and services will be covered with a minimum of 6-inches of compacted aggregate at driveways and sidewalks.

C. Temporary water main at road crossings and commercial driveways will be buried.

3.02 CLEANING, FLUSHING AND CHLORINATING

A. After installation and prior to connection to any water supply, temporary water main thoroughly clean and flush until the water runs clear. This includes water service piping.

B. After flushing, provide necessary disinfection of the temporary water main using the slug method:

1. Slowly add chlorine at a concentration of at least 100 mg/L so that mains and appurtenances are exposed to the highly chlorinated water for at least 3 hours.

2. Residual is to be measured at regular intervals at a point no more than 10-feet downstream from the injection point to assure 100 mg/L of free Cl_2 is being fed.

3. Free residual chlorine must be measured as the slug moves throughout the piping and the residual should not drop below 50 mg/L at any time.

C. Sampling shall be in accordance with Section 5.1 of AWWA Standard C651 as follows: “After final flushing and before customers are connected to the temporary water system, two consecutive sets of acceptable samples (reported as non-detect for Total Coliform Bacteria), collected at least 24 hours apart, shall be obtained. At least one set of samples shall be collected from every 1,000 feet of main, plus the one set from the end of the main line and one set from each branch.”

D. After two consecutive bacteriological samples are drawn, 24 hours apart, with negative results as outlined above, the water main will be allowed to be put into service.

E. Contractor is responsible for paying fees for bacteriological testing until satisfactory bacteriological sampling and testing is completed.

1. Draw samples of the water from the water main, with Engineer as a witness. Transport the samples for testing, and provide written confirmation of the sample results to Engineer.

2. Sampling will be in accordance with Section 5.1 of AWWA C651.

3.03 CONNECTION TO WATER SUPPLY

A. After successfully chlorinating the water main, connect the water main to the water supply. The temporary water main will be connected to the water supply with a double check backflow preventer.

B. Water service piping will be connected to the existing houses either at the existing curb stop or to a hose bibb. Contractor will be completely responsible for ork required to ensure that each water service has satisfactory water service from the temporary water main prior to removing the existing water main from service.

3.04 SYSTEM MONITORING AND MAINTENANCE

A. Monitor the temporary water main and services and will ensure that the system is functioning as intended and will remedy any defects in water delivery within 3 hours of being notified.

B. Monitor system pressure and ensure that pressure is not lowered due to defects in temporary water main system.

3.05 PROJECT COMPLETION

A. At project completion, after the new water main has been installed, tested, accepted and connected to the water supply and after water services have been connected/reconnected to the new main, the temporary water main and appurtenances will be removed and become the property of Contractor.

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 33 - Trenching and Backfilling

F. Section 32 92 23 - Sodding

1.03 REFERENCE STANDARDS

A. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc-Type Apparatus

B. ASTM D4491/D4491M - Standard Test Methods for Water Permeability of Geotextiles by Permittivity

C. ASTM D4533/D4533M - Standard Test Method for Trapezoid Tearing Strength of Geotextiles

D. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

E. ASTM D4751 - Standard Test Methods for Determining Apparent Opening Size of a Geotextile

F. ASTM D6241 - Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile- Related Products Using a 50-mm Probe

1.04 REQUIREMENTS OF REGULATORY AGENCIES

A. Contractor will secure permits, and post bonds or deposits required to comply with the "Soil Erosion and Sedimentation Control," requirements, being Part 91 of PA 451 of 1994 as amended and the National Pollution Discharge Elimination System (NPDES) Rules for storm water discharges from construction activity.

B. Comply with requirements of the agency having jurisdiction. Owner may withhold payment to Contractor equivalent to any fines resulting from non-compliance with applicable regulations.

1.05 PERFORMANCE REQUIREMENTS

A. Employ Best Management Practices as defined by standard EPA 832-R-92-005.

B. Put preventative measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.

C. Control increased storm water runoff due to disturbance of surface cover due to construction activities for this Project.

D. Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this Project.

E. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall event that might occur in 10 years.

F. Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this Project. Prevent windblown soil from leaving the project site. Comply with fugitive dust ordinances of agencies having jurisdiction. Prevent tracking or flowing of mud and sediment onto public or private roads, sidewalks or pavements outside of the site.

G. Prevent sedimentation of waterways on or off the project site, including rivers, streams, lakes, ponds, open drainage ditches, storm sewers, and sanitary sewers. If sedimentation occurs, install or correct preventative measures immediately at no cost to Owner. Comply with requirements of agencies having jurisdiction.

H. Maintain temporary preventative measures until permanent measures have been established. Remove temporary measures when permanent measures have been established.

I. If erosion or sedimentation occurs due to non-compliance with these requirements, remove deposited sediment or restore eroded areas at no cost to Owner.

1.06 SUBMITTALS

A. Submit schedule of Soil Erosion and Sedimentation Control activities to agency having jurisdiction. Include events (with days and/or dates of the various activities) for review and approval prior to obtaining a permit.

B. Contractor must provide evidence of Storm Water Operator license.

PART 2 PRODUCTS

2.01 SILT FENCE

A. Polypropylene geotextile fabric, resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; meeting the following requirements:

1. Average Opening Size: 30 US std Sieve , maximum; ASTM D4751.

2. Permittivity: 0.05 sec-1, minimum; ASTM D4491/D4491M.

3. Ultraviolet Resistance: Retaining at least 70% of tensile strength; ASTM D4355/D4355M after 500 hours exposure.

4. Tensile Strength: 100 lb - f minimum, in cross-machine direction;124 lb - f minimum in machine direction; ASTM D4632/D4632M.

5. Elongation: 15 to 30%; ASTM D4632/D4632M.

6. Tear Strength: 55 lb - f minimum; ASTM D4533/D4533M.

B. Posts will be 2 inch cross section hardwood stakes, minimum 3 feet long.

2.02 TURBIDITY BARRIER

A. Geotextile fabric curtain suspended from flotation devices at the water surface and held in a vertical position by a ballast chain in the lower hem. Turbidity barrier curtain must meet the following minimum requirements unless otherwise specified on the plans.

1. Consist of vinyl laminate on 1000 denier polyester fabric weighing 18 oz per sq yard, minimum.

2. Tensile strength of fabric will be 220 lb - f, minimum.

3. Edges of fabric to be reinforced with minimum 5/8 inch diameter polypropylene rope.

4. Ballast chain minimum 5/16 inch galvanized steel.

5. Buoyancy blocks providing buoyancy of 18 lb - f.

6. Length of curtain (water depth) 5 feet.

2.03 DEWATERING DISCHARGE FILTER BAG

A. UV-stabilized, non-woven geotextile bag to filter sediment from water prior to discharging. Geotextile fabric must meet the following minimum average roll requirements:

1. Tensile Strength: 180 lb - f minimum; ASTM D4632/D4632M

2. Elongation: 50 percent minimum; ASTM D4632/D4632M

3. CBR Puncture Strength: 300 lb f; ASTM D6241

4. Trapezoidal Tear: 70 lb - f; ASTM D4533/D4533M

5. Flow Rate: 80 gal/min/sft Minimum; ASTM D4491/D4491M

6. Permittivity: 1.4 sec -1 minimum; ASTM D4491/D4491M

7. Apparent Opening Size: 80 US std Sieve; ASTM D4751

8. UV-Stability: 70% retained strength; ASTM D4355 after 500 hours.

2.04 EROSION CONTROL BLANKETS

A. Erosion control blankets will not be used on this project. In lieu of these blankets, the Contractor will stabilize the seeded areas using straw crimped into the ground using a mulch anchoring tool (disc with vertical coulters) or by hydroseeding with a cellulose or wood fiber mulch.

2.05 BONDED FIBER MATRIX

A. Bonded fiber matrix (BFM) will consist of long strand, residual, softwood fibers joined together by a high-strength, nontoxic adhesive. BFM will be 100% biodegradable, and be non-toxic to fish, wildlife, and humans. Upon drying the matrix will form a high strength, porous and erosion

resistant mat that will not inhibit the germination and growth of plants. BFM will retain its form despite re-wetting.

B. Bonded fiber matrix will consist of:

1. Seed and Fertilizer per Section 32 92 19.

2. Wood Fiber Mulch: Thermo-mechanically defibrated long, softwood fibers manufactured from select northern softwood wood chips.

3. Polyacrylamide Binder: Site specific, fully biodegradable, polyacrylamides (PAM's) binders, with cross-linking long organic jute fibers

C. Materials will be mixed at the rate of 80 lbs per acre of PAM binder and 2500 lbs per acre of wood fiber mulch.

2.06 INLET FILTER FABRIC

A. Filter fabric will be constructed of 100% continuous polyester needle-punched non-woven engineering fabric. Filter fabric will be fabricated to provide a direct fit with the drainage structure cover. Filter fabric will have the following minimum physical properties.

B. Tensile Strength:80 lb - f minimum; ASTM D4632/D4632M

C. Elongation: 50 percent minimum; ASTM D4632/D4632M

D. CBR Puncture Strength: 300 lb - f minimum; ASTM D6241

E. Trapezoidal Tear: 70 lb - f minimum; ASTM D4533/D4533M

F. Flow Rate: 80 gal/min/sft minimum; ASTM D4491/D4491M

G. Permittivity: 1.4 sec -1 minimum; ASTM D4491/D4491M

H. Apparent Opening Size: 100 US std Sieve maximum; ASTM D4751

I. UV-Stability: 70% retained strength; ASTM D4355/D4355M after 500 hours.

2.07 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers include the following:

1. Turbidity Barrier: Tough Guy Type II by Aer-flo Canvas Products, Inc.

2. Wood Fiber Mulch: EcoFibre by Canfor Corporation.

3. Polyacrylamide Binder: HydroTurboNet by Straw Net, Inc.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to the greatest extent possible.

B. Except in areas to be cleared, do not remove, cut, deface, injure or destroy trees or shrubs without 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 Owner.

C. Conduct storm water pre-construction meeting with Site Contractor, all ground-disturbing Subcontractors, site Engineer of record or someone from their office familiar with the site and SWPPP, and state or local agency personnel in accordance with requirements of the special conditions.

D. Schedule work so that the soil surfaces are left exposed for the minimum amount of time. Place permanent soil and sedimentation control measures as soon as practical.

3.03 GENERAL

A. Do not discharge excavation ground water to the sanitary sewer, storm sewer, or to rivers, streams, etc. without authorization from the agency having jurisdiction. Construction site runoff will be prevented from entering any storm drain, river, stream, etc. directly by the use of silt fences or other suitable methods. Contractor will provide erosion protection of surrounding soils.

B. Sedimentation control devices will be installed prior to Contractor beginning Work. Soil erosion and sedimentation control devices must be maintained in an effective functioning condition at all times during the course of the Work.

C. Immediately bring earthwork to final grade and protect side slopes and backslopes from erosion. Plan and conduct earthwork to minimize duration of exposure of unprotected soils.

3.04 INSTALLATION - GENERAL

A. Install silt fences, ditch sediment traps, check dams, inlet filters, temporary gravel construction entrance/exits, turbidity barriers, erosion control blankets and other soil erosion control devices in accordance with the drawings and Storm Water Pollution Prevention Plan, or as may be dictated by site conditions in order to maintain the intent of the specifications and permits.

B. Deficiencies or changes on the drawings or SWPP must be corrected or implemented as site conditions change. Changes during construction must be noted in the SWPP and posted on the drawings.

C. Owner has authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and embankment operations and to direct Contractor to provide immediate permanent or temporary pollution control measures.

D. Remove temporary control devices after permanent measure are established. Remove and replace temporary control devices if they become ineffective at no additional cost to Owner.

E. Contractor will incorporate permanent erosion control features, paving, permanent slope stabilization, and vegetation into project at earliest practical time to minimize need for temporary controls.

F. Contractor will permanently seed and mulch cut slopes as excavation proceeds to extent considered desirable and practical.

3.05 DUST CONTROL

A. Keep dust down at all times, including during non-working periods. Sprinkle or treat, with dust suppressants, the soil at the site, haul roads, and other areas disturbed by operations. Dry power brooming is not permitted.

3.06 APPLICATION OF BONDED FIBER MATRIX

A. The slope will be prepared and graded prior to application of Bonded Fiber Matrix (BFM). Mixture of wood fiber mulch and polyacrylamide binder will be blended, with the appropriate amount of seed and fertilizer per Section 32 92 19, according to manufacturer's recommendations.

B. BFM will be hydraulically applied to the soil as a viscous mixture, crating a continuous, three-dimensional blanket that adheres to the soil surface. BFM will be mixed and applied at the rate as specified in this Section unless otherwise indicated on the Plans.

C. The resulting coverage must be at least 1/8 inch thick over the entire surface area. BFM will be applied in two applications from alternate directions to eliminate shadowing and will be applied when no rain is expected for 12 hours.

3.07 DEWATERING DISCHARGE

A. Should it be necessary for Contractor to do any dewatering during the course of construction, Contractor will filter discharge through a discharge filter bag or other sediment control device that will filter all discharge water.

B. No dewatering discharge will be allowed to flow unfiltered from the construction site.

3.08 MAINTENANCE

A. Maintain temporary erosion and sedimentation control systems as dictated by site conditions, indicated in the construction documents, or as directed by governing authorities or Owner to control sediment until final stabilization.

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

3.09 INSPECTION

A. General:

1. Contractor is responsible to obtain and/or serve as the Certified Operator.

    a. Weekly inspections are to be conducted by Contractor as a minimum, and after every rainfall event. A copy of the inspection report will be submitted to the agency having jurisdiction, as well as Owner and 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 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," tsubmit 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 Owner’s operation and maintenance personnel in the proper operation and maintenance of each piece of equipment and the system as a whole.

F. Equipment startup is to be witnessed by the Owner and the Engineer.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 71 23 - CONSTRUCTION LAYOUT

PART 1 GENERAL

1.01 RESPONSIBILITY FOR STAKING

A. Owner will set stakes and markers showing the locations on the surface of various parts of the Work as outlined herein. Additional stakes will be provided at the expense of the Contractor. Contractor will furnish such labor and assistance as the Owner may require in setting the same.

B. It will be the responsibility of the Contractor to transfer surface line and grade to the bottom of any tunnel or to the bottom of any other subsurface operations where ordinary surface line and grade is not feasible.

C. Contractor will utilize lasers, or surveying instruments run by qualified competent personnel to control the construction installation Work. If the method being used by the Contractor fails to give proper alignment and grade control to the Work, the Owner will be empowered to order the Contractor to use such other method(s) as will provide adequate control.

D. Engineer may require the Contractor, at the Contractor's expense, to provide such masts, scaffolds, batter-boards, straightedges, templates, or other devices as may be necessary to facilitate laying out, observing and constructing the Work.

E. In the event the Contractor presumes a staking inconsistency, the Contractor will notify the Engineer immediately to assist in resolving the concern.

1.02 STAKING SCHEDULE

A. Contractor will submit a completed staking schedule on the form provided by the Engineer showing the order in which the Contractor proposes to conduct the construction operation prior to the preconstruction meeting. The schedule will be submitted to the Engineer a minimum of three (3) working days prior to the start of construction.

B. During construction, the Contractor will to the extent possible, limit unnecessary staking requests and coordinate the construction schedule to provide for the efficient and effective use of the survey crew and eliminate excessive survey crew trips to the site.

1.03 LINE AND GRADE

A. Contractor will request, three (3) working days in advance, from the Engineer additional line and grade stakes as the Contractor may reasonably protect and preserve. Such request by the Contractor will be on a staking request form.

1.04 RELOCATION AND RE-ESTABLISHMENT

A. Construction Stakes:

1. Where change of location of stakes has been requested by the Contractor, or where the Contractor fails to properly preserve construction survey stakes, such resetting or relocations of stakes will be done by the Engineer and paid for by the Contractor on the basis of time and materials for such re-staking.

B. Survey Control Points:

1. Contractor will bear all expense involved in re-establishing and/or resetting any survey control point, land survey point or monument lost or disturbed during Contractor's construction operation. Such Work will be done under the direct supervision of a licensed land surveyor. Such survey control points will be marked and flagged by the Engineer prior to construction.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 CLEANING

A. Contractor will perform periodic cleaning to keep the Work, the site and adjacent properties free from accumulations of waste materials, rubbish and wind-blown debris, resulting from construction operations.

B. Waste material, debris and rubbish will be periodically removed from the site and disposed of at legal disposal areas away from the site.

C. Prior to Owner acceptance, Contractor will conduct an inspection of sight-exposed interior and exterior surfaces, and Work areas, to verify that the entire Work is clean.

D. Contractor will broom clean exterior paved surfaces and rake clean other exterior surfaces of the site.

1.02 PROJECT RECORD DOCUMENTS

A. Contractor will deliver one (1) copy of all Specifications, Plans, Addenda, Shop Drawings and Samples, annotated to show changes made during the construction process, to 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. Contractor's 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 Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of products, equipment and systems specified in the Contract Documents.

B. Operation and maintenance data required by the individual Specification sections and the manufacturer's operation and maintenance data required in Section 01 33 00 - Submittal Procedures, will constitute the basis of such instruction.

1.04 START UP

A. Contractor will coordinate efforts between Owner, 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. Owner can request written warranties for equipment not classified as major.

1.06 SUBSTANTIAL COMPLETION

A. Certification that the Work is substantially complete will be in accordance with the General Conditions.

1.07 FINAL PAYMENT AND ACCEPTANCE

A. The final inspection, final application for payment and acceptance will be in accordance with the General Conditions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 89 00 - SITE CONSTRUCTION PERFORMANCE REQUIREMENTS

PART 1 GENERAL

1.01 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 33 - Trenching and Backfilling

E. Section 32 12 16 - Bituminous Paving

F. Section 32 13 13 - Concrete Paving

G. Section 32 13 15 - Sidewalks and Driveways

H. 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 Owner.

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 following (existing trees to be replaced with like specie):

a. “Acer Rubrum” October Glory Red Maple, 2-1/2 inch, B&B (min)

b. “Malus Centzam” Centzam Crabapple,2 inch, B&B (min)

c. “Crataegus Phaenaopyrum” Washington Hawthorn, 8 foot, B&B (min)

d. “Pinus Nigra” Austrian Pine 6 foot, B&B (min)

e. “Picea Pungens” Colorado Spruce, 5 foot, B&B (min)

f. “Quercus Rubra” Red Oak, 2-1/2 inch, B&B (min)

g. “Pyrus Calleryana” Redspire Pear, 2 inch, B&B (min)

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 Owner, will transport excess excavation to a site(s) designated by the Owner.

1. Excess excavation will be graded by the Contractor to provide positive surface drainage of the site(s).

2. Grading will be done such that adjacent properties are not damaged or affected. The grading will include removal of all surface irregularities to provide a smooth surface ±3 inches.

C. When the excess excavation has not been requested by the Owner, the Contractor will remove and properly dispose of the material at no additional cost to the Owner.

D. Proper disposal of all excess excavation, including transportation, grading, and protection of adjacent properties will be considered as a final cleanup item. No additional payment will be made for this item.

E. Brush, roots, stumps, broken concrete, pipe, debris, and other extraneous material from the construction will become the property of the Contractor, and will be disposed of per all applicable Laws, rules or regulations. Removal and disposal of this material will be considered as part of final cleanup. No additional payment will be made for this item.

F. Owner approval of the final site(s) condition in writing will be required prior to final payment authorization.

END OF SECTION

SECTION 02 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 Owner 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 Owner.

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 Owner 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. Owner's Right of Access:

1. The right is reserved to the Owner 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 Owner.

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 Owner.

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 Owner, 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 Owner if any tree or shrub is damaged by the Contractor's operations. If, in the opinion of said agency or the Owner, 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 Owner. 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 Owner.

   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 Owner.

1.08 NOTIFICATION BY CONTRACTOR

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 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; ma 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 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 Owner’s property.

B. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner’s property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to the Owner’s designated storage area.

C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.

D. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Owner, items may be removed to a suitable,

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

1.04 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 Owner’s property, demolished materials will become the Contractor’s property and are to be removed from the site with further legal disposition legally at Contractor’s option.

1.06 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 Owner or the Owner's designated Representative.

5. Project Record Documents: Accurately record actual locations of capped utilities, concealed utilities discovered during demolition, and subsurface obstructions in accordance with Section 01 77 00.

1.07 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: Owner assumes no responsibility for actual condition of facilities to be demolished.

B. Occupancy: Owner may continuously occupy areas of site immediately adjacent to areas of selective demolition. Conduct demolition work in manner that will minimize need for disruption of the Owner’s normal operations.

C. Protections: Provide temporary barricades and other forms of protection to protect the public from injury due to selective demolition work.

1. Provide protective measures as required to provide free and safe passage of the Owner, tenants, vehicles, and general public to areas directly affected by demolition activities and those adjacent to such activities.

2. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished and adjacent facilities or work to remain.

3. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.

4. Protect floors with suitable coverings when necessary.

5. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing structures.

6. Provide temporary dust and debris barriers of fire resistant materials to control dust and debris and to confine demolition of existing and finished work.

7. Remove protections at completion of work.

D. Damages: Promptly repair damages caused to adjacent facilities by demolition work.

E. Traffic: Conduct selective demolition operations and debris removal to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

1. Do not close, block, or otherwise obstruct streets, walks, or other occupied or used facilities without approval from the Owner and providing alternate routes around closed or obstructed traffic ways.

F. Flame Cutting: Do not use cutting torches for removal until work area is cleared of flammable materials. At concealed spaces, such as interior of pipe spaces, verify condition of hidden space before starting flame-cutting operations. Maintain portable fire suppression devices during flame-cutting operations.

G. Explosives: Use of explosives is not permitted.

H. Utility Services: Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.

1. General:

a. Do not interrupt utilities serving occupied or used facilities, except when authorized in writing by the Owner. Provide temporary services during interruptions to existing utilities or schedule work to install interrupted utilities first, as acceptable to the Owner.

b. Maintain fire protection services during selective demolition operations.

c. Provide temporary support and protection of existing utilities, which cross the proposed piping trench.

d. Permits must be obtained from utility or agency having jurisdiction, if necessary. Contractor is responsible for all permit fees.

e. If relocation of any utility is necessary, the Contractor is responsible for associated fees or expenses, unless indicated otherwise.

2. Electrical Disconnection: Verify that onsite electrical wiring entering all structures to be demolished, or in close enough proximity to be damaged by the demolition operations, have been disconnected and/or de-energized prior to proceeding with demolition operations.

a. Coordinate with the local electrical utility company for any necessary relocation of utilities and be responsible for any associated fees or expenses.

3. Water Disconnection: Perform or verify that on-site water lines entering all structures or in close enough proximity to be damaged by the demolition operations have been disconnected and/or capped prior to proceeding with demolition operations.

4. Sewer Disconnection: Locate and bulkhead all sewer connections from the building structure prior to proceeding to demolition.

5. Gas Disconnection: Verify that on-site gas lines/mains entering all structures or in close enough proximity to be damaged as a result of the demolition operations have been disconnected and/or capped prior to proceeding with demolition operations.

6. Telephone and Cable Disconnection: Verify that on-site gas lines/mains entering all structures or in close enough proximity to be damaged as a result of the demolition operations have been disconnected and/or capped prior to proceeding with demolition operations.

I. Environmental Controls: Use water sprinkling, temporary enclosures, and other methods to limit dust and dirt migration. Comply with governing regulations pertaining to environmental protection.

1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

J. Provide ventilation to maintain non-toxic unpolluted working area for adjacent the Owner's operating areas and construction/demolition areas. Welding and cutting torches producing smoke or toxic fumes must be adequately ventilated.

1.09 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 Owner as necessary to continue overall job progress without delay.

3.02 UTILITY SERVICES

A. Maintain existing utilities indicated to remain in service and protect against damage during demolition operations.

1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by the Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to the Owner and to governing authorities

2. Schedule tie-ins to existing systems to minimize disruption.

B. Coordinate with the Owner any building service interruptions.

1. At least two weeks' notice is required for most outages; Contractor to confirm with eacy affected utility.

2. Do not disable or disrupt building fire or life safety systems without three (3) calendar days prior written notice to the Owner.

a. Coordinate work to ensure fire sprinklers, fire alarms, smoke detectors, emergency lighting, exit signs and other life safety systems remain in full operation in occupied areas.

C. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving building to be selectively demolished. Extent of electrical and mechanical utilities to be removed is shown on Contract Drawings.

1. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections to maintain continuity of service to other parts of the building before proceeding with selective demolition.

2. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit after bypassing.

3.03 UTILITY ABANDONMENT AND REMOVAL

A. Abandoned Piping: Close open ends of abandoned underground piping that is indicated to remain in place. Provide sufficiently strong closures to withstand hydrostatic or earth pressure that may result after ends of abandoned utilities have been closed.

1. Close open ends of concrete or masonry utilities with not less than 12 inches thick brick masonry bulkheads.

2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Wood plugs are not acceptable.

B. Abandoned Structures: Remove structure and close open ends of the remaining piping or remove top of structure down to not less than 4 feet. below final grade; fill structure with 21A compacted gravel, to within 12 inches of top of structure remaining, and fill with concrete.

C. Removal: Dispose of removed material promptly unless directed by the Owner to salvage removed utility pipes and other items.

3.04 REMOVING BITUMINOUS SURFACING

A. When removing an existing bituminous pavement, the edges of the area to be removed will be cut along straight lines, either perpendicular or parallel to the direction of travel, for the full depth of the bituminous surfacing with the cut edge a minimum of 18 inches (450 mm) 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.

3.05 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.

3.06 POLLUTION CONTROLS

A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

B. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.07 DUST CONTROL

A. Employ all necessary engineering controls and misting operations to prevent emission of dust and migration of airborne materials off site from impacting surrounding properties.

B. Constant watering for the site is required to prevent dust emission during the demolition and removal operations. Water for dust control may be available for use from the fire hydrants located in the area.

1. Verify with the Owner for water availability and pay for the use of the agency having jurisdiction over water.

C. If the Contractor wants temporarily to stockpile any demolition debris and pulverized concrete materials that may generate dust at the site, the stockpiles will be covered with a 10 mil plastic sheet.

3.08 SALVAGE REQUIREMENTS

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

1. Owner will tag components and equipment designated for salvage.

B. Protect designated salvage items from demolition operations until items can be removed.

1. Carefully remove components and equipment indicated to be salvaged.

2. Disassemble as required to permit removal .

3. Package small and loose parts to avoid loss.

4. Mark equipment and packaged parts to permit identification and consolidation of components of each salvaged item.

5. Deliver salvaged items to the Owner and obtain signed receipt from the Ownerindicating that the Owner has received tagged items.

3.09 SELECTIVE DEMOLITION

A. General:

1. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete Work within limitations of governing regulations and as follows:

    a. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.

    b. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.

2. Perform work in safe and systematic manner.

3. Use such methods as required to complete work indicated on Contract Drawings and minimize disturbance of the Owner’s normal operations.

4. Use water as necessary to lay dust when chipping, coring, or sawing concrete, masonry or similar materials. Water must be controlled inside buildings by damming, mopping or vacuuming. Prevent water from entering underfloor electrical ducts.

5. Completely backfill below-grade areas and voids resulting from utility removal and other demolition work.

6. Remove debris from roof or other above-grade location through enclosed chute or bundle, and lower by hand or with hoisting device.

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 abandone concealed piping and conduits as necessary to facilitate the remodeling work. Remove dther 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.

3.10 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 activites, as directed by the Engineer and at no cost to the Owner.

D. Conduct a detailed inspection after patching and repairing has been completed in the presence of the Owner and 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.

3.11 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove and legally dispose of demolished materials, site debris, rubbish, and other materials resulting from demolition operations promptly removed.

1. Conduct demolition and removal of debris in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities will not be closed or obstructed without prior permission from the Owner.

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

3.12 RECYCLING

A. Owner encourages the recycling of demolition debris where appropriate. Contractor has the option to recycle any material found or demolished on site in order to reduce costs or project duration.

B. Although the materials are not limited, it is recommended that at least steel and concrete be recycled.

1. Steel and concrete to be recycled can be stockpiled on site and eventually removed. Steel separated from demolition rubble may be recycled and becomes the property of the Contractor.

2. Contractor will not be allowed to abate on site any lead paint found on the steel unless appropriate procedures and federal, state and local codes or regulations are followed.

3. Remove any material stockpiled for recycling from the site prior to the contract end date and/or site restoration.

3.13 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 Owner, and return adjacent areas to condition existing prior to start of work.

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 23 - Sodding

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 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. Sites shall be graded as specified on the Plans or as determined by the Engineer. Contractor shall carry out the grading operation to prevent standing water and soil saturation detrimental to structures and improvements.

B. Provisions shall be made 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. Topsoil encountered along the route of the construction shall be pushed back and preserved for use in restoration following completion of the construction. The topsoil must remain on each given parcel and lot throughout the Project including the existing road right-of-way adjoining the parcel or lot where it 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. If there is insufficient working area, the topsoil may be removed, stockpiled and later replaced on the original lot or parcel. Contractor shall furnish the Engineer with written permission obtained from the property owner of the property on which the topsoil is to be stockpiled, prior to commencing the stockpiling operation.

D. Topsoil shall be salvaged in an amount equivalent to the quantity required by the Plans. Topsoil salvaged in excess of that required by the Plans or as required by the Engineer will be disposed of by the Contractor at Contractor's expense.

E. Before removing topsoil, vegetation shall be reduced to a height of approximately 4 inches and all such vegetation and all brush, stones, rocks, and any other objectionable litter or foreign material shall be removed and disposed of before the ground is broken for topsoil removal.

F. Equipment and methods of operations shall be such as to avoid the lifting of the subsoil. If soil or weather conditions are unsuitable, the Contractor shall cease stripping until stripping can resumed in a suitable manner.

G. Topsoil shall be removed within the grading limits for cuts and shall be removed to a width and depth specified on the Plans or as determined by the Engineer.

H. Topsoil shall be stockpiled 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. Stockpiles shall be located and shaped so as to avoid diversion of storm water runoff, either in or out of the limits of construction, towards buildings, creation of standing water or interference of controlled irrigation.

J. Contractor shall not place topsoil around trunks and root areas of trees to be preserved.

K. Topsoil shall be kept separate from other excavated materials that are to be used for embankment and shall be completely removed from any designated area prior to the beginning of regular excavation or placing embankment in the area.

L. Topsoil stockpiles shall be located as near the original location as possible and no payment will be made for overhaul.

M. After the completion of construction, the topsoil shall be screened through a 5/8 inch maximum size mesh screen, spread, graded, raked and prepared for seeding or sodding.

3.03 EXISTING SAND ON-SITE

A. In those instances where the construction takes place within private easements, the sand shall not be removed from each parcel or lot. Sand encountered in existing road right-of-way may be used for construction purposes throughout the Project providing it meets the requirements for the material it is intended to be used for.

B. Removal of sand from the Project will not be allowed, except for the volume displaced by the new construction.

C. If there is insufficient working area, the sand may be removed, stockpiled and replaced on the original lot or parcel. Contractor shall furnish the Engineer with written permission obtained from the property owner of the property on which the sand is to be stockpiled, prior to commencing the stockpiling operations.

3.04 ROUGH GRADING

A. The site shall be graded as necessary to comply with the Plans or as determined by the Engineer. The subgrade shall be roughly established by cut or fill, approximately parallel to proposed finished grades and to elevations which allow for thickness of topsoil and installation of site or roadway improvements.

B. In fill areas all debris shall be removed from the area to be filled. Material detrimental to site improvement shall be removed from the site and acceptably disposed of as specified in Section 01 89 00.

C. Original ground shall be scarified and benched or otherwise treated to provide adequate bond and to prevent slippage of fill.

D. Fill material shall be free of debris or other detrimental material and shall have a moisture content within 2% optimum moisture when placed. Fill shall be compacted to a density not less than 95% of the maximum unit weight and placed in layers no less than 9 inches and no greater than 15 inches. The maximum unit weight shall be determined by ASTM D698, Method B.

E. If possible fills or embankments shall be constructed when the ground is frost-free and there is favorable weather. However if winter grading is necessary, all ice and snow shall be removed from the surface of the ground before the fill or embankment is placed.

F. No frozen material will be allowed in the fill area or in the embankment being constructed.

1. Frozen material on a partially completed fill shall be removed before placing any additional fill. Frozen material shall be stockpiled outside the 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. Subgrade shall be smoothed parallel to proposed finished grades and elevations specified on the Plans. Subgrade shall be scarified to assure bond with the topsoil prior to spreading of the topsoil.

B. Topsoil shall be spread uniformly to provide a smooth, even surface at a finish grade specified on the Plans or acceptable to the Engineer. After spreading, the topsoil shall be compacted lightly as necessary to minimize settlement. Final grades shall not vary more than 0.1 foot from the elevations indicated on the Plans.

C. Finished grading shall be done when the ground is frost-free and weather is favorable.

3.06 ADJUST STRUCTURES

A. Structures to be adjusted shall be as called for on the Plans or as indicated by the Engineer. Adjustment of structures shall apply where the elevation of the casting is either raised 12 inches or less, or lowered 6 inches or less.

B. For Rehabilitation/Resurfacing Projects

1. For structures in existing pavement, the pavement shall be sawcut a minimum of 5-foot by 5-foot unless otherwise shown on the plans.

    a. For structures in concrete pavement, the structure shall be adjusted, backfilled and compacted as noted below. Six inches of aggregate base course, unless otherwise noted on the plans, shall be placed below the proposed concrete pavement.

        1) In areas of new concrete pavement, the concrete pavement around the structure shall be poured integral with the rest of the pavement.

        2) For resurfacing projects, expansion or epoxy anchored hook bolts shall be placed 18 inches on center around the edges of the existing concrete pavement, unless otherwise shown on the plans. The concrete pavement, minimum 8 inches thick, shall be replaced around the structure to the grade of the adjoining concrete pavement.

    b. For structures in bituminous pavement, the pavement shall not be sawcut until after the bituminous base or leveling courses have been completed. The structure shall be adjusted, backfilled and compacted as noted below.

        1) Six inches of aggregate base course, unless otherwise noted on the plans, shall be placed below the proposed pavement. A minimum of 8 inches of concrete pavement, unless otherwise noted on the plans, shall be placed to the elevation of the adjoining bituminous base or leveling courses.

        2) Bituminous wearing course around the structure shall be placed integral with the wearing course on the remainder of the project.

C. For Bituminous Reconstruction or New Construction Projects

1. The frame and cover on new and existing structures shall be removed and the structure plated prior to placing the bituminous base or leveling courses.

2. Bituminous base and leveling courses shall be placed over the plated structures.

3. Prior to placing the bituminous wearing course, the bituminous base and leveling courses shall be sawcut a minimum of 5-foot by 5-foot unless otherwise shown on the Plans. The structure shall be adjusted, backfilled and compacted as noted below.

4. Six inches of aggregate base course, unless otherwise noted on the Plans, shall be placed below the proposed pavement. A minimum of 8 inches of concrete pavement, unless otherwise noted on the plans, shall be placed to the elevation of the adjoining bituminous base course.

5. Bituminous wearing course around the structure shall be placed integral with the wearing course on the remainder of the project.

D. Sawcutting, removal and replacement of concrete and bituminous pavement, and aggregate base course, shall be incidental to the adjusting the structure unless otherwise noted in the Contract Documents.

E. Existing frame and cover shall be carefully removed and stored, and shall be reinstalled on the same structure, unless a new frame and cover are called for on the Plans.

F. Brick courses or concrete adjustment rings shall be removed or installed as necessary to adjust the structure's frame and cover to the proper elevation.

G. Brick or concrete adjustment rings shall be set in mortar or installed as shown on the Plans and as determined by the Engineer.

H. The outside surface of the new brick or block structures shall receive a masonry plaster coat, a minimum of 1/2 inch thick.

I. The structure shall be properly backfilled with Granular Material compacted in place, and meeting the approval of the Engineer.

J. The flow in the entire system shall be maintained, at the Contractor's expense, while performing any part of the Work. Also, the structure shall be cleaned and all unsuitable material shall be disposed of at the Contractor's expense.

3.07 RECONSTRUCT STRUCTURES

A. Structures to be reconstructed shall be as called for on the Plans or as determined by the Engineer. Reconstruction of structures shall apply where the elevation of the casting must be raised in excess of 12 inches, lowered in excess of 6 inches, or to rebuild portions of the existing structure which are deteriorated.

B. For Rehabilitation/Resurfacing Projects:

1. For structures in existing pavement, the pavement shall be sawcut a minimum of 5-foot by 5-foot unless otherwise shown on the plans.

a. For structures in concrete pavement, the structure shall be reconstructed, backfilled and compacted as noted below. Six inches of aggregate base course, unless otherwise noted on the Plans, shall be placed below the proposed concrete pavement.

1) In areas of new concrete pavement, the concrete pavement around the structure shall be poured integral with the rest of the pavement.

2) For resurfacing projects, expansion or epoxy anchored hook bolts shall be placed 18 inches on center around the edges of the existing concrete pavement, unless otherwise shown on the plans. The concrete pavement, minimum8 inches thick, shall be replaced around the structure to the grade of the adjoining concrete pavement.

b. For structures in bituminous pavement, the pavement shall not be sawcut until after the bituminous base or leveling courses have been completed.

1) The structure shall be reconstructed, backfilled and compacted as noted below.

2) Six inches of aggregate base course, unless otherwise noted on the Plans, shall be placed below the proposed pavement. A minimum of 8 inches of concrete pavement, unless otherwise noted on the Plans, shall be placed to the elevation of the adjoining bituminous base or leveling courses.

3) The bituminous wearing course around the structure shall be placed integral with the wearing course on the remainder of the Project.

C. For Bituminous Reconstruction or New Construction Projects:

1. Frame and cover on all new and existing structures shall be removed and the structure plated prior to placing the bituminous base or leveling courses.

2. Bituminous base and leveling courses shall be placed over the plated structures.

3. Prior to placing the bituminous wearing course, the bituminous base and leveling courses shall be sawcut a minimum of 5-foot by 5-foot unless otherwise shown on the Plans. The structure shall be reconstructed, backfilled and compacted as noted below. Six inches of aggregate base course, unless otherwise noted on the plans, shall be placed below the proposed pavement.

4. A minimum of 8 inches of concrete pavement, unless otherwise noted on the plans, shall be placed to the elevation of the adjoining bituminous base course.

5. The bituminous wearing course around the structure shall be placed integral with the wearing course on the remainder of the Project.

D. Sawcutting, removal and replacement of concrete and bituminous pavement, and aggregate base course, shall be incidental to the reconstructing the structure unless otherwise noted in the Plans.

E. The existing frame and cover shall be carefully removed and stored, and shall be reinstalled on the same structure unless a new frame and cover are called for on the Plans.

F. Existing corbel entrance sections or precast concrete chimney type entrance shall be removed along with any additional brick courses or precast concrete sections necessary to achieve the amount of reconstruction called for on the Plans or as determined by the Engineer.

G. The necessary brick work and precast concrete sections shall be installed to meet the design grade.

H. Manhole steps shall be furnished and shall be installed, as necessary, so that maximum spacing is 24 inches. Brick or concrete adjustment rings shall be set in mortar or installed as shown on the Plans and as determined by the Engineer.

I. The outside surface of the new brick or block structures shall receive a masonry plaster coat, a minimum of 1/2 inch thick. The structure shall be properly backfilled with granular material, compacted in place, and meeting the approval of the Engineer.

J. The flow in the entire system shall be maintained, at the Contractor's expense, while performing any part of the Work. The structure shall be cleaned and unsuitable material shall be disposed of at the Contractor's expense.

END OF SECTION

SECTION 31 23 10 - VIBRATION AND NOISE CONTROL

GENERAL

1.01 SCOPE OF WORK

A. This Section specifies requirements for:

1. Limiting and monitoring ground vibrations and noise levels originating from vibration and impulsive-noise producing construction operations.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 33 00 - Submittal Procedures

1.03 DEFINITIONS

A. Impulsive Noise: Noise occurring at low frequencies. The spectrum occurring below 15 Hz is generally not audible to humans.

B. Particle Velocity: A measure of the intensity of ground vibration, specifically the time rate of change of the amplitude of ground vibration.

C. Peak Particle Velocity (PPV): The maximum of the three ground vibration velocities measured in the vertical, longitudinal and transverse directions. Velocity units are expressed in inches per second (in/s).

1.04 SUBMITTALS

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

B. General Monitoring Plan:

1. Two weeks prior to commencement of vibration and noise-inducing construction operations, submit a General Monitoring Plan that includes:

a. Procedures that will be used to identify appropriate monitoring locations and establish accurate distances to individual operation locations.

b. Methods of notifying private property owners to obtain permission for access and monitoring.

c. Manufacturer's technical information, descriptions, and specifications for all instruments and sensors to be used for vibrations and noise level monitoring.

d. Calibration certificates for all instruments and sensors.

C. Notifications:

1. Owner shall be notified 24 hours before vibration and impulsive noise producing operations occur at any specific location. Contractor shall provide the Owner with a schedule for all such operations and shall notify the Owner if any operations is delayed for more than one hour.

2. Contractor shall furnish the Owner with a list of those parties notified in accordance herewith prior to the start of such operations. The list shall include names, addresses and telephone numbers.

1.05 COORDINATION DOCUMENTATION

A. For all work sites, prior to starting vibration and impulsive noise producing operation, the Contractor shall notify the appropriate local municipal officials, above- and below-ground utility owners and the general public expected to be potentially affected, the Contractor's intent to conduct controlled operations. Notice shall be given to all operators of all buried pipes, cables, conduits and overhead utility lines and poles located within a 100-foot radial distance of the operation area. Public notice should be given to any occupants and property owners of all buildings located within 250-foot of where operation occurs in excavations and within 250 feet of all surface operation locations.

B. Notification to appropriate local municipal officials and utility owners or operators shall be done in writing, at least 48 hours prior to the start of vibration and impulsive noise producing construction operations at a particular site or sooner if so required by any applicable local law or regulation, and shall indicate the expected hours that construction operations might occur and the expected date that operation will be completed. Upon completion of construction operations at the particular site, utility owners or operators shall be notified that construction operations have ceased in the area for the duration of the project.

PRODUCTS – NOT USED

EXECUTION

3.01 GENERAL

A. Contractor shall erect and maintain signboards of adequate size at locations agreed with the Owner stating that operations are taking place in the area, and such signs shall be clearly visible at all points of access to the area.

3.02 VIBRATION AND NOISE CONTROL

A. Do not operate power operated construction tools or machinery between the hours of 7:00 PM and 7:00 AM (See also Section 01 32 13 – Construction and Schedule Constraints). In addition, do not operate at any time any device in such a manner that the noise created substantially exceeds the noise customarily and necessarily attendant to the reasonable and efficient performance of such equipment.

B. Contractor shall conduct all work without causing damage to existing structures from ground vibrations caused by construction operations.

C. Contractor shall monitor and record ground vibration and noise for all vibration producing operations, unless approved otherwise by the Owner. Work shall be designed to ensure allowable levels are not exceeded.

D. Contractor shall monitor each activity expected to cause excessive noise or vibration in excess of the limits set forth herein and the local noise ordinances. Contractor shall adjust construction procedures accordingly to ensure allowable levels are not exceeded.

E. Vibration and Noise Limits and Control Criteria:

1. Operation shall be designed to conform to the vibration limits shown in table below:

Structure	Maximum PPV (in/s)
Residential Buildings	0.5
Schools and Public Buildings	0.5
Heavy Commercial Buildings	1.0
Brick-Lined Sewers	3.0
Buried Pipes and Utilities	4.0

2. The noise level resulting from construction shall be within the limits specified in OSHA regulations and all local ordinances.

F. Monitoring Requirements:

1. Monitoring and recording of vibration and impulsive noise shall be performed by the Contractor for construction operations that generate noticeable ground vibration and impulsive noise, if required by the Owner.

3.03 SUSPENSION OF OPERATION

A. Vibration and noise producing operations shall be suspended by the Owner for any of the following reasons:

1. Contractor's safety precautions are inadequate.

2. Noise or ground vibration levels exceeding specified limits.

3. Existing structural conditions on-site or offsite are aggravated or are damaged by operation.

B. Vibration and noise producing operations shall not resume until the Owner has reviewed and approved the Contractor's revised operation plan with modifications correcting the conditions causing the suspension.

3.04 DAMAGE

A. Contractor shall restore or replace; utilities, equipment, and structures damaged by vibrations at no additional cost to the Owner.

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 32 90 00 - Plantings

G. Section 32 92 23 - Sodding

1.03 REFERENCE STANDARDS

A. Unless otherwise specified, the Work for this Section shall conform 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 (2,700 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. Finish subgrade surface shall be shaped 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 shall provide the Engineer with two (2) certified copies of the sieve analysis of the backfill material.

2. Testing of the material and the certification of the test results shall be performed by a testing laboratory approved by the Engineer.

3. Testing lab shall provide the Engineer with two (2) certified copies of the compaction and moisture tests of the backfill and subgrade materials.

4. Testing of the materials and the certification of the test results shall be performed by a testing laboratory approved by the Engineer.

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. Submissions shall be made not later than 10 working days prior to any installation.

1.06 PRODUCT DELIVERY STORAGE AND HANDLING

A. Geotextile fabric shall be furnished and stored in a wrap that will protect the geotextile from ultraviolet radiation and abrasion. Geotextile shall be covered with the aggregate base as per plan within two (2) weeks of its placement.

1.07 SOIL EROSION AND SEDIMENTATION CONTROL

A. Contractor 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 drain, to reduce erosion of the slopes, and to prevent silting in of 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. Granular Material shall conform to the requirements for Class II granular material as specified in MDOT Section 902.

2.02 AGGREGATE MATERIALS

A. Aggregate materials, used for undercut backfill shall be crushed limestone, natural aggregate, blast furnace slag, or crushed concrete, meeting the requirements of 21AA, 21A, or 22A as specified in MDOT Section 902. Crushed concrete shall be free of all steel and other deleterious materials.

2.03 SUBGRADE STABILIZATION FABRIC

A. Subgrade stabilization fabric shall be composed of synthetic fibers formed into a woven fabric. The fibers shall be composed of 85% propylene or ester polymers. The geotextile shall conform 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. Structures and sewers to be removed shall be called for on the Plans or as determined by the Engineer. Removal or abandonment of structures shall be in accordance with Section 01 89 00.

3.02 HOLES

A. Earth removed during any phase of the excavation or removal operations, resulting in a hole or void, shall be replaced by backfilling to the proposed subgrade with a suitable Granular Material approved by the Engineer.

B. Material shall be compacted to 95% of its maximum unit weight.

C. The furnishing, placing and compacting of the backfill material shall be at the Contractor's expense.

3.03 SALVAGING AND STOCKPILING TOPSOIL

A. Topsoil, within the grading limits for cuts, and where the fill is less than 5 feet in height to the top of proposed road, shall be removed to a depth and width specified on the Plans.

B. Topsoil from peat and muck areas shall not be removed.

C. Topsoil salvaged in excess of that required by the Plans will be disposed of by the Contractor at Contractor's expense.

D. Removing and salvaging topsoil shall be in accordance with Section 31 22 00.

3.04 PREPARING ROADWAY SUBGRADE

A. Muck, peat and other unsuitable material within the roadway shall be removed, displaced or otherwise treated, as shown on the Plans or as directed by the Engineer.

B. Deposits of frost heave material within lines 2 feet outside the proposed roadbed shall be removed 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. Ice and snow shall be removed from the surface of the ground before the embankment is placed.

D. Muck, peat, frost heave material and other unsuitable material shall be disposed of outside the highway limits or shall be spread uniformly in low places beyond the roadway limits when so approved by the Engineer.

E. Old road surfacing or gravel, crushed stone, or other nonrigid type surfacing, occurring within the area of the roadbed and underlying proposed embankment less than 1 foot in depth, and which is not to be salvaged and incorporated in the new Work, shall be plowed or scarified full depth, spread and compacted to form a uniform foundation, before any new embankment is placed.

F. Old pavement and other rigid structures, occurring within the area of the roadbed and underlying the proposed embankment less than 1 foot in depth and which are not to be incorporated into the new Work, shall be broken up, removed and disposed.

3.05 SUBGRADE

A. Area to be paved shall be excavated and smoothed to the line, grade and cross section as indicated on the Plans.

B. Subgrade between the lines 2 feet on either side of the proposed edge of pavement or curb shall be compacted 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. Subgrade shall be completed ahead of placing forms or paving a distance equal to the distance of one day's average paving operation. Prior to the paving operation, the subgrade shall be shaped and compacted to the Plan cross section by approved mechanical means.

3.06 PAVEMENT EXCAVATION

A. Pavement excavation shall consist of Work required 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. Excavation shall consist of the following items, any of which or all of which may be included or incidental to it; removing trees, stumps, hedges, roots, culverts, sewers, miscellaneous structures, roadway excavation, removing of asphalt or concrete pavements, curbs, curb and gutters, sidewalks, end headers, removing aggregate surfaces, salvaging and stockpiling topsoil, subgrade undercut, excavation for structures, trimming and finishing earth grade, fine grading, right-of-way ditching and restoration, and the disposal of unsuitable material.

C. 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 shall be completely removed and properly disposed of as specified in Section 31 11 00.

D. Earth and other existing materials shall be excavated for the full depth and width of the cross section as shown on the Plans. Material shall be excavated sufficiently for setting of forms or slip-form equipment. Excavation shall be limited to 3,000 linear feet of right-of-way unless additional lengths are requested in writing and approved by the Engineer.

E. Excess excavated material shall be removed from the project by the Contractor along approved routes to disposal sites approved by the Owner. Disposal of excess excavation and maintenance of the dump sites shall be considered incidental to the price paid for excavation and shall be as specified in Section 01 89 00.

3.07 BORROW EXCAVATION

A. Materials which are secured from locations outside of the project limits for the purpose of completing embankments and other items, will be considered as borrow excavation. Borrow pits and the materials to be removed therefrom shall be subject to the inspection of the Engineer and shall be secured by the Contractor, unless otherwise provided.

B. Borrow excavation will be measured by volume in cubic yards compacted in place, based on the neat lines called for on the Plans or as authorized by the Engineer. To facilitate the

accurate measurement of borrow quantities, unless otherwise specified in the Contract Documents, the Contractor shall perform all the regular excavation and grading with existing materials for any designated area and the Engineer will cross section these areas prior to the Contractor furnishing and placing the required borrow material. Engineer will then resection the completed area and compute the volume of borrow material in its compacted-in-place state. Borrow material placed beyond the neat lines called for on the Plans or which is not authorized by the Engineer in writing will not be measured and computed as borrow excavations. Measurement of borrow material by truck count will not be acceptable.

C. Public and private roads used by the Contractor between the source of borrow and the Project shall be maintained by the Contractor, at Contractor's expense, including repairs of any damage caused by Contractor's operations. Also included is the application of a dust palliative when necessary, as determined by the Engineer.

3.08 EMBANKMENTS

A. Embankments shall be constructed with sound earth. The materials shall be deposited and compacted by either the Twelve Inch Layer Method, or the Controlled Density Method. The Controlled Density Method will be required unless the Twelve Inch Layer Method or some other method is specifically called for on the Plans.

B. The topsoil shall be stripped from the entire fill area. The depth of the topsoil to be removed shall be as shown on the Plans or as determined by the Engineer. After the topsoil is removed, the entire area upon which the embankment is to be constructed shall be compacted to not less than 90% of the maximum unit weight, to a depth of 9 inches.

C. Where stones are prevalent, the material shall be carefully placed so that all large stones will be well distributed and the crevices completely filled with smaller stones, earth, sand or gravel so as to form a solid embankment. Rock or fragmental material of such size as would prohibit it from being placed in layers of the specified depth shall not be placed in the embankment. In no case shall stones over 3 inches in diameter be placed within 12 inches of the surface of the earth grade within the areas between lines 2 feet outside of the edges of proposed roadbed.

D. Frozen material shall not be placed in the embankment nor shall embankment be placed 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. The material shall be deposited and spread in layers not more than 12 inches depth, loose measure, parallel to the finished grade and extending to the full width of the embankment. The material shall be deposited by operating the conveying equipment over the layer being placed, insofar as feasible.

    b. Each layer shall be compacted to not less than 95% of the maximum unit weight as determined at the existing moisture content. The operation of compacting shall be continued until each layer is compacted to the required density for its full width.

2. Controlled Density Method:

a. The material for the embankment shall be deposited and spread in layers not more than 9 inches in depth, loose measure, and extending to the full width of the embankment, except that granular material may be spread and compacted in layers not more than 15 inches in thickness if the specified density is obtained.

b. The material for embankments of 5 feet or less and the bottom 4 feet of embankments of more than four 4 feet above the surface of the ground upon which the embankment is to be constructed shall have not more than the optimum moisture content at the time of compaction.

c. The material for that part of the embankment more than 5 feet above the surface of the ground upon which the embankment is to be constructed shall have a moisture content of not greater than 3% above optimum at the time of compaction, except that the moisture content of the top 3 feet of the embankment shall not exceed optimum.

F. If granular material is used to construct the embankment, it shall be at a moisture content below saturation.

G. If the material contains an excess of moisture, it shall be dried to the required moisture content before being compacted.

H. Each layer of material containing the required amount of moisture shall be compacted to not less than 95% of its maximum unit weight, unless otherwise specified, before the succeeding layer is started.

I. When the original ground upon which the embankment is being placed, or any section of compacted embankment, or the soil in cut sections becomes rutted or distorted by the Contractor 's equipment, the method of operation shall be changed to eliminate this condition. Contractor shall reshape and recompact any areas so rutted or distorted at his own expense. This shall be done before any succeeding layers are placed.

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. Any excavated material removed during grading and stored along the line of Work between curb and sidewalk on improved lawns shall not be left longer than 48 hours. Lawns or otherwise improved areas shall be left in a neat and clean state within the specified 48 hours.

C. During the excavation operation, including the placing of the subbase, the Work area shall be kept free of water. A dewatering system shall be provided and maintained by the Contractor at Contractor's expense. The dewatering system shall remain in operation until the 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. When proof rolling under structures, one-half of the passes made with the roller shall be in a direction perpendicular to the other passes.

C. Proof rolling shall be done in the presence of the Engineer. Rutting or pumping shall indicate unsatisfactory material and that material shall be undercut as determined by the Engineer, and replaced with the appropriate fill material.

D. Perform proof rolling only when weather conditions permit. Do not proof roll wet or saturated subgrades. Materials degraded by proof rolling a wet or saturated subgrade shall be replaced by the Contractor as determined by the Engineer at no cost to the Owner. Notify the Engineer 3 days prior to proof rolling.

3.11 SUBGRADE UNDERCUT EXCAVATION

A. Unsuitable subgrade excavation shall 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. The areas excavated of unsuitable material, unless otherwise specified in the Contract Documents, shall be backfilled with non-frost heaving material similar to the adjacent soil. However, in areas as determined by the Engineer where free water due to seepage is present, the excavation shall be backfilled with MDOT Granular Material, Class II and drainage shall be provided. The backfill shall be compacted 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. The fabric shall be laid smooth and free of tension stress, wrinkles or creases.

B. Fabric strips shall be placed to provide a minimum overlap of 24 inches for each joint. Fabric shall be placed so that the upper strip will overlap the next lower strip.

C. Should the geotextile be damaged during construction, the torn or punctured section shall be repaired by placing a piece of fabric that is sufficiently large to cover the damaged area plus 24 inches 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 the earth grade has been constructed to the required grade, all stones and rocks more than 3 inches in diameter, appearing on the surface of the subgrade shall be removed.

B. Earth grade and the subgrade shall be trimmed to the grade called for on the Plans. Subgrade, where a subbase or base course is required, shall be trimmed to the established grade within ± 0.1 foot. Where a subbase or base course is not required, the subgrade shall be trimmed to the established grade within ± 3/4 inch.

C. The earth grade outside the subgrade shall be trimmed, all irregularities made smooth and the entire site or roadway completed to the required lines, grades, and cross sections. Backslopes and fill slopes shall be finished as either Class A or Class B slopes. Class A slopes shall be required unless otherwise specified in the Contract Documents.

1. Class A Slopes:

    a. Class A slopes shall be finished to the average slopes shown on the Plans with no variations at any point more than 0.1 foot above or below the established grade measured at right angles to the slopes.

2. Class B Slopes:

    a. Class B backslopes shall be finished to the average slopes shown on the Plans with no variations at any point more than 0.5 foot above or below the established grade measured at right angles to the slope.

    b. Class B fill slopes shall be finished 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. The remainder of the completed fill slope shall conform to the requirements for Class B backslopes.

3. The degree of finish of the slopes shall be that obtainable from machine operations. The smoothness of surface finish ordinarily associated with template or string line and hand operations will not be required, but abrupt variations will not be permitted.

4. Debris except sod, leaf mold and rotted forest litter shall be removed and loose clods of earth extending beyond the slope tolerance specified shall be broken or removed.

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. Where trees or other restrictions do not interfere, the tops of backslopes, bottoms of fill slopes and all other angles in the lines of the cross section shall be rounded to form vertical curves as shown on the Plans or as determined by the Engineer. Transitions in length of vertical curves shall be gradual and shall present a uniform and attractive appearance. When ditches are constructed in peat, vertical curves may be omitted.

3.15 SUBBASE

A. Granular material for subbase shall be evenly spread and compacted as specified in MDOT Section 301.

B. The thickness of each layer placed shall be determined by the required density obtained but shall not exceed 15 inches in depth, loose measure.

C. The subbase shall be constructed to the alignment, grade and cross section shown on the Plans. Should the subgrade at any time prior to or during the placing of the subbase become soft or unstable such that rutting occurs in the subgrade, or if the subgrade material is forced up into the subbase material, the operation shall immediately cease and the mixed material shall be removed and disposed of. The subgrade shall be corrected and new subbase material placed and compacted. This Work shall be considered incidental to the construction of the Project.

3.16 SCARIFY, RE-GRADE AND COMPACT EXISTING SUBGRADE

A. The existing subgrade (base) shall be scarified to a depth of 9 inches within the limits as shown on the plans. The subgrade shall then be re-shaped to the cross section as shown on the plans and compacted to 95% of its maximum unit weight by rolling with a roller weighing not less than 10 tons.

3.17 ROADWAY DITCHING

A. Ditching shall be constructed at the locations called for on the Plans or as determined by the Engineer. The ditch 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.

B. The excess material from the ditch construction shall be disposed of by the Contractor at Contractor's expense.

C. The ditch section shall be graded to receive topsoil and seed.

1. Topsoil, seed, fertilizer and mulch shall conform to the requirements specified on the Plans and in Section 32 92 19.

D. Contractor, at Contractor's expense, shall furnish, place and compact any additional material needed to construct the ditch at the location and cross sections called for on the Plans.

3.18 RIGHT-OF-WAY RESTORATION

A. The right-of-way shall be restored in accordance with the type and location specified on the Plans. The right-of-way 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.

B. Excess material from the right-of-way restoration operation shall be disposed of by the Contractor at Contractor's expense, as specified in Section 01 89 00.

C. The right-of-way shall be graded to receive topsoil and seed.

1. Topsoil, seed, fertilizer and mulch shall conform to the requirements specified on the Plans and in Section 32 92 19.

D. Contractor, at Contractor's expense, shall furnish, place, and compact any additional fill, meeting the approval of the Engineer, needed to construct the right-of-way to the cross sections called for on the Plans.

3.19 MACHINE GRADING

A. The Work of machine grading shall consist of light grading of such character that, in general, the excavation from ditches and roadbed will be utilized in shaping shoulders and adjacent shallow fills and the work can be performed by a blade grader or similar equipment. Machine grading shall apply on the sections shown on Plans or specified in the Contract Documents.

B. Work shall include all necessary scarifying, plowing, discing, moving and shaping the earth to develop the cross section shown on Plans.

C. Ditches shall be in reasonably close conformity with the line and grade as shown on the Plans or as directed and must drain runoff waters to outlets shown on the Plans or designated by the Engineer.

D. The roadbed shall be finished to grade with a blade grader or equivalent equipment.

E. Intersections, approaches, entrances, and driveways shall be graded as shown or as directed, except that loading and hauling of earth will not be required as part of this Work.

3.20 MAINTENANCE AGGREGATE

A. Contractor shall furnish and install MDOT 21A, 21AA or 22A maintenance aggregate to maintain pedestrian and traffic access. Aggregate shall be placed and compacted to maintain access in areas as 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. Taking of samples and the testing required shall be performed by a testing laboratory suitable to the Owner and approved by the Engineer.

C. Engineer shall determine the location and number of samples to be made. The testing laboratory shall furnish the Engineer with two (2) certified copies of the results of all tests.

D. Testing procedures shall conform to current MDOT Standards for Construction .

E. Maximum unit weight when used as a measure of compaction or density of soils shall be understood to mean the maximum unit weight per cubic foot (or cubic meter) as determined by ASTM D1557, Method D, modified to include all the material passing the 1 inch sieve.

3.22 DEFECTIVE WORK

A. Any portion of the backfill, subbase or subgrade which is deficient in the specified density shall be corrected by methods meeting the approval of the Engineer.

B. Any extra testing or sampling required by the Engineer, because of deficiencies, shall be at 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 32 92 23 - Sodding

F. Section 33 14 00 - Water Utility Distribution Piping

1.03 REFERENCE STANDARDS

A. Unless otherwise specified, the Work for this Section shall conform 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. The testing laboratory shall provide the Engineer with two (2) certified copies of the test results of the compaction of the backfill. The testing for compaction and the certification of the test results shall be performed by a testing laboratory approved by the Engineer.

1.05 SOIL EROSION AND SEDIMENTATION CONTROL

A. Contractor 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 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. Granular material shall conform to the requirements for Class II, as specified in MDOT Section 902. Granular Material shall be natural bank run sand.

2.02 COARSE AGGREGATE

A. Coarse aggregate shall conform to the requirements for 6A, as specified in MDOT Section 902.

PART 3 EXECUTION

3.01 DEWATERING

A. The area within the vicinity of the new Work shall be dewatered in accordance with Section 31 23 19 prior to the excavation operation.

B. Depth of the dewatering shall be sufficient to allow the excavation to remain in a dry condition during the construction of the structure, including the excavating, backfilling and compacting operations.

3.02 SHEETING, SHORING, AND BRACING

A. Contractor shall furnish, place and maintain at all times such sheeting, shoring, and bracing of the excavated area as may be required for safety of the workmen and for protection of the new Work or adjacent structures, including pavement, curbs, sidewalks, pipelines and conduits next to, or crossing the excavated area, and for the protection and safety of pedestrian and vehicular traffic.

B. Contractor shall be responsible for the complete design of all sheeting, shoring and bracing Work. The design shall be appropriate for the soil conditions, shall be of such strength, quality, dimension and spacing as to prevent caving or loss of ground or squeezing within the neat lines of the excavation, and shall effectively restrain movement of the adjacent soil.

C. Prior to installing the sheeting, shoring or bracing, the Contractor shall submit Plans for this Work to the Engineer for informational purposes only.

D. Sheeting, shoring, and bracing, and excavation shall conform to current federal or state regulations for safety.

E. Where indicated on the Plans and where necessary in the Work, install and leave sheeting, shoring, and bracing in place. No extra compensation shall be paid to the Contractor for sheeting, shoring or bracing left in place unless otherwise indicated in the Proposal.

F. Supports for pipes, conduits, etc., crossing the excavated area shall conform to the requirements of the owners of such facilities and if necessary, shall be left in place.

G. Furnishing, placing, maintaining and removing of sheeting, shoring, and bracing materials shall be at the Contractor's expense unless otherwise indicated in the Proposal.

H. Contractor shall not remove the sheeting, shoring or bracing until the structure has obtained sufficient strength to support the external loads.

I. Sheeting, shoring and bracing material shall not come in contact with the structure, but shall be installed so that no concentrated loads or horizontal thrusts are transmitted to the structure.

3.03 COFFERDAMS

A. A cofferdam shall consist of the maintenance, installation and removal of a substantially watertight enclosure or a well-point system or similar system, which will permit construction of the substructure, above seal or subfooting, in the dry and without damage to 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. Interior dimensions of cofferdams shall be such as to give sufficient clearance for the construction of forms and the inspection of their exteriors, and to permit dewatering outside of the forms.

E. Cofferdams, caissons or cribs which are tilted or moved laterally during the process of sinking shall be righted or enlarged so as to provide the necessary clearance.

F. Cofferdams shall not be braced to substructure forms. They shall be constructed so as to protect the Work in place against damage from high water and to prevent injury to the foundation by erosion.

G. No timber bracing shall extend into or remain in the finished concrete.

H. Cofferdams shall be removed in such a manner as not to disturb or mar the finished concrete. When called for on the Plans or where necessary in the Work, cofferdam sheeting shall be left in place.

I. Furnishing, construction, maintenance and removal of the cofferdams including pumping shall be at the Contractor 's expense.

J. If the Contractor elects to use a well-point system or similar system, he shall be responsible for any claims for damages resulting therefrom.

3.04 EXCAVATION

A. Excavation shall include the site clearing and grubbing, the excavating and disposing of all materials encountered, the supporting and protecting of all structures and/or utilities encountered above and below the ground surface, and the removal of water from the construction site.

B. Excavation shall also include the removal of existing structures, as shown on the Plans or as determined by the Engineer.

C. Rock excavation, if applicable, shall be performed as a part of the excavation in accordance with specifications contained elsewhere.

D. Contractor shall keep the limits of excavation operations within a reasonable close conformity with the location and grade, of each structure.

E. Excavated materials shall be temporarily stored in a manner that will not cause damage to trees, shrubs, fences, improvements, utilities, private property or traffic. Excavated materials shall not be placed at such locations that will endanger the banks of the excavation by imposing loads thereon.

F. The excavation shall be of sufficient size to allow for the construction of the new Work, the placing and compacting of the backfill and for the dewatering operation.

G. When concrete is to bear on or against an excavated surface other than rock, special care shall be taken not to disturb the surface. The final removal of the foundation material to grade shall not be made until just prior to the placing of the concrete.

H. Concrete shall not be placed until the depth of the excavation has been checked and the suitability of foundation material has been reviewed by the Engineer.

I. Excavated material, determined by the Engineer as suitable for backfill may be used.

J. Excess materials shall be disposed by the Contractor, at Contractor's expense, as specified in Section 01 89 00.

K. The elevations for the bottom of footings shall be subject to such changes as are necessary to insure a satisfactory foundation. Any changes required shall be reviewed by the Engineer prior to making the change.

L. The surface of all rock or other hard material upon which concrete is to be placed shall be free of all loose fragments, cleaned and cut to a firm surface. The surface shall be level, stepped or serrated, as shown on the Plans.

M. Unsound material underlying proposed structures shall be removed and replaced with granular material approved by the Engineer, in layers not exceeding 6 inches in depth. Each layer shall be compacted to 95% of maximum unit weight unless indicated otherwise on the Plans, or within these specifications.

3.05 BACKFILL

A. Backfill material shall be placed only after the new Work and backfill material have been inspected by the Engineer.

B. Backfill shall not be placed against any portion of the new Work until the required curing, surface finishing and waterproofing of such portions have been completed. Backfill which will place an unequalized horizontal loading on the new Work shall not be placed until the concrete has attained at least 70% of its design strength. To equalize horizontal loadings, the required backfill around the new Work shall be placed on opposite sides at the same time.

C. Granular material shall be used 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. Spaces excavated and not occupied by the new Work or by the specified backfill material, shall be backfilled with suitable material from the excavation.

E. After the backfill has been placed and compacted to the flow line elevation of any weep holes indicated on the Plans, the back end of each weep hole shall be covered with not less than 2 cubic feet of coarse aggregate.

F. Large stones, boulders, broken rocks, concrete, and masonry shall not be used in the backfill.

G. Backfill shall be carried up to the surface of the adjacent ground or to the elevation of the proposed earth grade, and its top surface shall be neatly graded. Fills around all new Work shall be trimmed to the lines shown on the Plans or as directed by the Engineer.

3.06 COMPACTING BACKFILL

A. All backfill behind and around the new Work shall be placed in layers, not more than 9 inches in depth, and shall be compacted to not less than 95% of the maximum unit weight.

B. Areas where the density does not affect the construction, as determined by the Engineer, shall be compacted to not less than 90% of maximum unit weight.

C. Backfill material shall be placed as specified in MDOT Section 206.03.B, except for the following modifications. The backfill material shall have a moisture content not greater than 3% above optimum, at the time of compaction. If the material contains an excess of moisture, it shall be dried to the required moisture content before being installed.

D. Each layer of material containing the required amount of moisture shall be compacted to not less than 95% of the maximum unit weight, unless otherwise specified on the Plans or authorized by the Engineer, before the succeeding layer is started.

E. Compaction of the backfill will not be paid for separately, but shall be considered incidental to the Work of backfilling and shall include all the Work of manipulating the soil to obtain the specified densities. No additional compensation will be allowed for any delay required to obtain the specified moisture content or the specified density.

3.07 CLEANUP

A. Immediately following the placing and compacting of the backfill, the excess material shall be removed and disposed of by the Contractor, at Contractor's expense, as specified in Section 01 89 00.

B. The construction area shall be graded and left in a neat, workmanlike condition.

C. At a seasonally correct time, the disturbed area shall be raked, having topsoil placed thereon, fertilized and restored per the requirements of Section 32 9219.

3.08 TESTING

A. During the course of the Work, the Engineer may require testing for compaction or density of the backfill. The taking of samples and the testing required shall be performed by a testing laboratory approved by the Engineer.

1. The cost for testing and sampling shall be at the expense of the Owner.

B. The testing laboratory shall furnish the Engineer with two (2) certified copies of the results of all tests. Testing procedures shall conform to current MDOT's Standard Specifications for Construction.

C. The maximum unit weight, when used as a measure of compaction or density of soils, shall be understood to mean the maximum unit weight per cubic foot or per cubic meter as determined by ASTM D1557, Method A, for Granular Materials, and Method C for all other soils.

3.09 DEFECTIVE WORK

A. Any portion of the backfill which is deficient in the specified density shall be corrected by the methods meeting the approval of the Engineer. Any extra testing or sampling required because of apparent deficiencies shall be at 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 32 92 23 - Sodding

G. Section 33 14 00 - Water Utility Distribution Piping

H. Section 33 41 00 - Storm Utility Drainage Piping

1.03 REFERENCE STANDARDS

A. Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications:

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 shall provide the Engineer with two (2) certified copies of the test results of the compaction of the backfill.

B. Testing for compaction and the certification of the test results shall be performed by 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. 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 drain, to reduce erosion of the slopes, and to prevent silting in of 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. Granular Material Class II shall conform to the requirements for granular material Class II, as specified in MDOT Section 902 except as follows. The granular material shall 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. Concrete shall 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. Fly Ash shall have a maximum loss on ignition of 12% and meet the other requirements of ASTM C618 (Class F).

2. Water shall meet 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. The temperature of the flowable fill mix as manufactured and delivered shall be at least 50 degrees Fahrenheit.

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. The area within the vicinity of the trenching operation shall be dewatered in accordance with Section 31 23 19 prior to the trenching operation.

B. Depth of the dewatering shall be sufficient to allow the trench excavating operation including backfilling and compacting to proceed in a dry condition.

3.02 TRENCH EXCAVATION

A. Open cut trench excavation shall include the site clearing and grubbing, the excavating of all materials encountered, the supporting and protecting of all structures and/or utilities encountered above and below the ground surface, and the removal of water from the construction site.

B. The trenching operation shall commence 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. The trench shall be excavated in reasonably close conformity with the lines and grades specified on the Plans or as established by the Engineer.

D. The excavated materials shall be temporarily stored along the trench in a manner that will not cause damage to trees, shrubs, fences, improvements, utilities, private property, public property or traffic. The excavated materials shall not be placed at such locations that will endanger the trench banks by imposing loads thereon.

E. For rigid pipe, the trench shall be of sufficient width to provide adequate working space to permit the installation of the pipe and the compaction of the bedding material under and around the pipe. However, for rigid pipe, the width of the trench from below the pipe bedding to 12 inches above the top of the pipe shall 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. To support the additional load of the backfill when the maximum trench width as specified for rigid pipe is exceeded, the Contractor shall install, at Contractor's expense, concrete

encasement which shall completely surround the pipe and shall have a minimum thickness at any point of 1/4 of 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. The concrete encasement shall consist of 3,000 psi strength concrete.

F. For flexible pipe, the minimum width shall be not less than the greater of either the pipe outside diameter plus 16 inches or the pipe outside diameter times 1.25, plus 12 inches. The maximum trench width for flexible pipe shall not exceed the minimum width by more than 6 inches.

1. To support the additional load of the backfill when the maximum trench width as specified for flexible or semi-rigid pipe is exceeded, the Contractor shall 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.

G. When, through the Contractor's construction procedure or because of unsuitable existing ground conditions, it becomes impossible to maintain alignment and grade properly, the Contractor, at Contractor's expense, shall excavate below the normal trench bottom grade and shall fill the void with a large size aggregate or 3,000 psi (21 MPa) concrete as approved by the Engineer to ensure that the pipe when laid in the proper bedding will maintain correct alignment and proper grade.

H. Trench excavations, including those for shafts and structures, shall be adequately braced and/or sheeted where necessary to prevent caving or squeezing of the soil.

3.03 SHEETING, SHORING, AND BRACING

A. Contractor shall furnish, place and maintain sheeting, shoring, and bracing of the trench and/or shaft as may be required for safety of the workmen and for protection of the new Work or adjacent structures, including pavement, curbs, sidewalks, pipe lines, and conduits next to or crossing the trench; and for the protection and safety of pedestrian and vehicular traffic.

B. Contractor shall be responsible for the complete design of all sheeting, shoring and bracing Work. The design shall be appropriate for the soil conditions; and shall be of such strength, quality, dimension and spacing as to prevent caving or loss of ground or squeezing within the neat lines of the excavation; and shall effectively restrain movement of the adjacent soil.

C. Prior to installing the sheeting, shoring or bracing, the Contractor shall submit plans for this Work to the Engineer for informational purposes only.

D. Sheeting, shoring, bracing, and excavation shall conform to the current federal or state regulations for safety.

E. Where indicated on the Plans and where necessary in the Work, install and leave sheeting, shoring, and bracing in place. No additional compensation shall be paid to Contractor for sheeting, shoring or bracing left in place.

F. Supports for pipes, conduits, etc. crossing the trench shall conform to the requirements of the owners of such facilities and if necessary, shall be left in place.

G. Furnishing, placing, bracing, maintaining, and removing of sheeting, shoring, and trenching materials shall be at the Contractor's expense.

H. Contractor shall not remove the trench sheeting, shoring and bracing until the pipe has been properly bedded, and the trench backfilled to sufficiently support the external loads.

I. Sheeting, shoring, and bracing material shall not come in contact with the pipe, but shall be installed so that no concentrated loads or horizontal thrusts are transmitted to the pipe.

3.04 PIPE BEDDING

A. Install and compact in 6 inch layers. Particular care shall be taken to assure filling and tamping all spaces under, around, and above the top of the pipe. Work in and around pipe by hand to provide uniform support.

B. Rigid Pipe Bedding:

1. Rigid pipe bedding shall conform to ASTM C1479, except as noted.

2. Class R-A:

a. Pipe shall be bedded in crushed stone bedding material placed on the trench bottom. Bedding shall have a minimum thickness beneath the pipe of 4 inches or 1/4 of the outside diameter of the pipe, whichever is greater; and shall extend up the sides of the pipe to the horizontal centerline.

b. The top half of the pipe shall be covered 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. Pipe shall be bedded in crushed stone bedding material placed on the trench bottom. Bedding shall have a minimum thickness beneath the pipe of 4 inches or 1/8 of the outside diameter of the pipe, whichever is greater, and shall extend 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 shall be granular material Class II. This material shall be placed in 6 inch layers with each layer thoroughly compacted by mechanical means with the finished compacted material a minimum of 12 inches above the top of pipe.

4. Class R-C:

a. Pipe shall be bedded in granular material Class II placed on the trench bottom. Bedding shall have a minimum thickness beneath the pipe of 4 inches or 1/8 of the outside diameter of the pipe, whichever is greater, and the bedding shall extend to a level not less than 12 inches above the top of the pipe.

b. This material shall be placed in 6 inch layers with each layer thoroughly compacted by mechanical means with the finished compacted material a minimum of 12 inches above the top of pipe.

C. Flexible Pipe Bedding:

1. Flexible pipe bedding shall conform to ASTM D2321, except as noted. A continuous and uniform bedding shall be provided in the trench for all buried pipe.

2. Class F-I:

    a. Pipe shall be bedded in crushed stone bedding material placed on the trench bottom. The bedding shall have a minimum thickness beneath the pipe of 4 inches and shall extend up the sides of the pipe until the top of pipe is covered by a minimum thickness of 12 inches.

    b. Where allowable trench widths are exceeded, bedding shall be used to the full width between undisturbed trench walls. Concrete cradle bedding shall not be used.

3. Class F-II:

    a. Pipe shall be bedded in crushed stone bedding material placed on the trench bottom. Bedding shall have a minimum thickness beneath the pipe of 4 inches or 1/8 of the outside diameter of the pipe, whichever is greater; and shall extend 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 shall be granular material Class II. This material shall be placed in 6 inch layers with each layer thoroughly compacted by mechanical means with the finished compacted material a minimum of 12 inches above the top of pipe.

    c. Where allowable trench widths are exceeded, bedding shall be used to the full width between undisturbed trench walls. Concrete cradle bedding shall not be used.

4. Class F-III:

    a. Pipe shall be bedded in granular material Class II placed on the trench bottom. Bedding shall have a minimum thickness beneath the pipe of four 4 inches or 1/8 of the outside diameter of the pipe, whichever is greater, and the bedding shall extend to a level not less than 12 inches above the top of the pipe. This material shall be placed in 6 inch layers with each layer thoroughly compacted by mechanical means with the finished compacted material a minimum of 12 inches above the top of the pipe.

    b. Where allowable trench widths are exceeded, bedding shall be used to the full width between undisturbed trench walls. Concrete cradle bedding shall not be used.

3.05 BACKFILLING TRENCHES

A. Backfill material shall be placed on sections of bedded pipes only after such pipe bedding and backfill materials have been approved by the Engineer.

B. The trench backfilling shall follow the pipe laying as closely as possible. However, at no time shall the pipe laying in any trench precede backfilling of that trench by more than 100 feet, unless otherwise directed by the Engineer.

C. Backfilling shall not be done in freezing weather except by permission of the Engineer. Frozen materials shall not be used in trench backfilling.

D. The following trench backfill specifications are for use in that portion of the trench beyond the scope of the pipe bedding requirements which normally stops at a point 12 inches above the top of pipe. Backfill material to be placed above pipe bedding shall be free of cinders, ashes, refuse, boulders, roots, stumps, trees, timbers, brush, debris, or other extraneous materials which in the opinion of the Engineer, are unsuitable. Rocks or stones having a dimension

larger than 6 inches shall not be placed within three 3 feet of the top of the pipe. Large stones may be placed in the remainder of the trench backfill only if well separated and arranged so that no interference with backfill settlement will result.

E. The type and method of backfilling is dependent on its location and function and shall conform to the following requirements:

1. Trench B:

a. Trenches under road surfaces, pavement, curb, driveway, sidewalk and where the trench edge is within three 3 feet of the pavement and as noted on the plans shall be backfilled with natural bank run sand meeting the requirements of granular material Class II, unless otherwise indicated on the Plans.

b. Trenches under pavement to be constructed in the near future, as noted or shown on the Plans, shall be backfilled 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, the backfill between the two shall be natural bank run sand meeting the requirements of granular material Class II, unless otherwise indicated on the Plans, constructed as herein specified.

d. The material shall be placed in uniform layers that can be adequately compacted and tested from the surface of that layer and shall be compacted to 95% of the materials maximum unit weight, unless otherwise specified on the Plans or by the Engineer.

2. Trench A;

a. Trenches shall be backfilled with suitable excavated material placed in uniform layers that can be adequately compacted and tested from the surface of that layer.

b. Each layer shall be thoroughly compacted by approved mechanical methods to a density equivalent to the undisturbed adjacent soil or 90% of its maximum unit weight, whichever is less.

3. Unless otherwise specified on the Plans or as directed by the Engineer, the trench backfill shall be carried to the adjacent existing ground or proposed grade whichever is higher.

4. Where any backfill or bedding as shown on the plans or specified is to be flowable fill, care shall be used to avoid displacing any pipes or structures due to fluid pressure. Pipes in backfill areas may need to be secured to avoid the buoyancy effect.

3.06 COMPACTING BACKFILL

A. Compaction of the backfill will not be paid for separately, but shall be considered incidental to the Work of installation of the pipe and backfilling and shall include all the Work of manipulating the soil to obtain the specified densities. No additional compensation will be allowed for any delay required to obtain the specified moisture content or the specified density.

3.07 CLEANUP

A. Immediately following the placing and compacting of the backfill, the excess material shall be removed and disposed of by the Contractor, at Contractor's expense, as specified in Section 01 89 00. The construction area shall be leveled and left in a neat workmanlike condition.

B. At a seasonally correct time, approved by the Engineer, the disturbed area shall be raked, having topsoil placed thereon and restored.

1. Restoration with seed, fertilizer and mulch shall be the requirements of Section 32 92 19 .

2. Restoration with sod shall be in accordance with Section 32 92 23.

3.08 FIELD TESTING

A. During the course of the Work, the Engineer may require testing for compaction or density of the backfill. The taking of samples and the testing required shall be performed by a testing laboratory suitable to the Owner and approved by the Engineer.

1. Cost for testing and sampling shall be at the expense of the Contractor and considered incidental to the Work.

B. The maximum unit weight, when used as a measure of compaction or density of soils, shall be understood to mean the maximum unit weight per cubic foot or per cubic meter as determined by ASTM D1557, Method C.

3.09 DEFECTIVE WORK

A. Any portion of the trench backfill which is deficient in the specified density shall be corrected by methods meeting the approval of the Engineer.

B. Additional testing or sampling required because of deficiencies shall be at the Contractor's expense.

END OF SECTION

SECTION 31 50 00 - TEMPORARY EXCAVATION SUPPORT SYSTEMS

GENERAL

1.01 SCOPE OF WORK

A. The work specified in this Section includes initial ground support systems for trenches and near surface excavations for manholes, junction chambers, diversion structures, and miscellaneous concrete structures.

B. This Section does not apply to shafts or tunnel excavations.

1.02 REFERENCE STANDARDS

A. ASTM A36/A36M: Carbon Structural Steel

B. ASTM A53/A53M: Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

C. ASTM A307: Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength

D. ASTM A328/A328M: Steel Sheet Piling

E. ASTM A500/A500M: Cold-Formed Welded

F. ASTM A501/A501M: Hot-Formed Welded and Seamless Carbon Steel Structural Tubing

G. ASTM A572/A572M: High-Strength Low-Alloy Columbium-Vanadium Structural Steel

H. ASTM A690/A690M: High-Strength Low-Alloy Nickel, Copper, Phosphorus Steel H-Piles and Sheet Piling with Atmospheric Corrosion Resistance for Use in Marine Environments

I. ASTM A992/A992M: Structural Steel Shapes

J. ASTM F3125/F3125M: High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength

K. AWS D1.1/D1.1M: Structural Welding Code – Steel

L. AWPA C2: Lumber, Timber, Bridge Ties and Mine Ties Preservative Treatment by Pressure Processes

M. 29 CFR: US Department of Labor, Occupational Safety and Health Administration, Code of Federal Regulations Title 29 Labor

1.03 DEFINITIONS

A. Initial ground support system: the support installed prior to or concurrent with excavation to maintain stability of the opening until the excavation is closed.

B. Definitions of terms in OSHA 29 CFR, Subpart P - Excavations, 1926.650(b), in its entirety, shall apply to this Section. The following terms are of particular interest to this Section: excavation, trench, protective system, support system, shoring system, sloping system, benching system, shield, trench box, cave-in, and competent person.

1.04 SUBMITTALS

A. Submit Contractor's designer and specialty Subcontractor qualifications a minimum of 30 days prior to the execution of the excavation. Qualifications shall demonstrate experience in the design and construction of at least three prior projects that are similar in nature including excavation support system types, depths and ground and groundwater conditions.

B. Submit an excavation support plan stamped and signed by a Professional Engineer licensed in the State of Michigan. The plan must be submitted at least 30 days prior to the execution of the excavation and it shall include the following information:

1. Limits of working area, including minimum lateral distance from the edge of the excavation support system for construction equipment, stockpiled construction, and excavated materials.
2. Maintenance of traffic (if any).
3. Proposed excavation support systems, location, layout, depth, extent of the different types of support relative to existing features and projected structures, and methods and sequence of installation and removal (if applicable).
4. Design assumptions and calculations.
5. Member sizes and thickness, and bending tolerances of structural steel.
6. Connection details.
7. Maximum allowable spacing between bracing points on compression members to maintain stability and alignment.
8. For initial support members installed in advance of excavation, describe: methods of installation, of quality control, and of correcting support system defects exposed by subsequent excavation.
9. List and specifications sheets of equipment to be used for installation of the excavation support systems.
10. Quality of materials to be used (by reference to recognized standards such as ASTM), including but not limited to timber structural members, steel plates, and blocking; steel structural members, plates, and bars; concrete; and grout.
11. Monitoring schedule, installation procedures and location plans for vibration/noise monitoring, and geotechnical instrumentation.

C. For excavations utilizing Cement-Bentonite (C-B) Wall with Embedded Soldier Piles, submit the following:

1. Include description of methods of pre-trenching to clear debris prior to installing guide walls.
2. Provide details of guide walls.
    a. Submit complete descriptions of all equipment to be used in the trench excavation, and in the mixing, storing, circulating, pumping and placing the wall lagging material.

3. Clearances from adjacent and final structures including excavation tolerances.
4. Sequence and details of wall excavation and backfill, set time, and final strength.
5. Schedule of operations including anticipated times for mobilization, trench excavation, mixing, and backfilling the wall for each location.
6. Parameters and assumptions for the cement-bentonite mix including, but not limited to, the slurry density, viscosity, trench stability calculations, and C-B strength upon setting.
7. Location and methods of monitoring and testing cement-bentonite slurry mix to comply with specified requirements.
8. Method of excavating through boulders or other obstructions.
9. Method of monitoring plumbness and deviation of wall during excavation, and details of proposed corrective measures to be implemented if necessary.
10. Methods for checking and proving the cleanliness of trench bottoms prior to placement of soldier piles
11. Details for placement of soldier piles to be embedded in the walls.
12. Method of maintaining stability of excavated trenches in case of sudden loss of slurry suspension.
13. Measures for preventing slurry from entering utility facilities.
14. Method of protecting slurry operations, including storage, handling, and disposal, during all seasons.
15. Control of drainage, spills, wastes, etc.
16. Method of controlling/containing spoils, slurry, cement-bentonite, within the construction area.
17. Proposed cement-bentonite and/or lean mix concrete mix design.

1.05 MANUFACTURE'S SPECIFICATIONS FOR BENTONITE INCLUDING LABORATORY TEST RESULTS.

1. Details of testing methods used to verify the effectiveness of mix design, with respect to strength, hydraulic conductivity criteria and acceptance criteria.

B. After construction, provide records of the following information:

1. Panel and piles identifications
2. Dates, times, and quantities of panel/pile excavation; end stop and soldier pile placement, if used; tremied concrete placement; and end stop removal, if used.
3. Plan location, deviation from plan location, and dimensions of the excavation.
4. Details and locations of any instrumentation installed.
5. Description of any variations from the Contract Drawings and Shop Drawings

C. For protective systems for trench excavations, submit, as applicable:

D. OSHA soil classifications used in design

1. Tabulated data used in design

2. For sloping and benching systems, submit trench configurations and maximum allowable slopes.

3. For shield systems, submit plan indicating the sizes, types, and configurations of structural components; lateral load capacity; and connection details, where shields are to be stacked.

4. For shield systems or support systems that are manufactured or pre-engineered, submit, in addition, specifications, recommendations, and limitations issued by the manufacturer; and manufacturer's written approval of any deviation from said specifications, recommendations, and limitations.

1.06 QUALITY ASSURANCE

A. Qualifications:

1. For Cement-Bentonite (C-B) wall construction:

a. Contractor shall meet the same qualifications listed in Specification Section 31 56 00 - Slurry Walls.

B. Testing of bentonite slurry shall be performed by the Contractor as required hereinafter with the results of every test submitted to the Contractor within the time limit specified herein. Testing methods and equipment shall be in accordance with API RP 13B-1.

1. Required Tests:

a. Density, by mud density balance

b. Viscosity, by Marsh Cone Method

c. pH

2. Calibrate density measuring devices (e.g. – Baroid scale) monthly, or more often if necessary, to ensure correct calibration.

3. Slurry sampling and testing: Collect slurry samples for testing in accordance with the requirements herein.

C. Slurry Trench Excavation Bottom Inspection: Contractor shall measure and record the excavation bottom elevation in the presence of the Owner at the following stages to determine whether soil from trench/excavation sides or other sediment has collected:

1. Immediately after excavation to the final depth.

2. Immediately after each cleaning and desanding.

D. Testing and inspection of soldier pile and cast-in-place concrete shall be in accordance with requirements specified elsewhere in the Contract Documents.

1.07 PERFORMANCE REQUIREMENTS

A. General:

1. Select methods of excavation and temporary excavation support systems that are compatible with conditions described in the Geotechnical Baseline Report (GBR) , and with requirements for placement of permanent structures, control of water, safety of personnel, and protection of adjacent property.

2. Temporary excavation support systems shall provide lateral support, prevent loss of ground, limit ground displacements, and prevent damage to adjacent property (i.e. utilities, structures, roadways, and other facilities) through the entire duration of the excavation activities, and until after design strength of the final structures has been reached.

3. Specific methods of initial ground support and groundwater control required in this Section or shown on the Drawings are acceptable support systems. Contractor is solely responsible for any additional construction measures necessary to achieve the requirements of this Section and is solely responsible for any damages resulting from failure to meet the requirements of this Section.

B. Tolerances:

1. Temporary excavation support systems shall be set out and constructed to maintain the minimum clear dimensions for permanent structures as shown on the Contract Drawings and to provide adequate working space to construct the permanent structures.

2. Guide wall tolerances for C-B walls shall be the same as those specified in Specification Section 31 56 00 – Slurry Walls.

3. Verticality of drilled soldier piles and C-B panels shall be checked every 15 feet of depth during excavation of each element as a minimum. Vertical tolerance shall not exceed 0.5% of the depth.

4. The depth of the support of excavation system shall not deviate more than 1-ft from the planned depth, unless accepted by the Owner to accommodate field conditions.

1.08 INITIAL GROUND SUPPORT SYSTEMS SHOWN ON DRAWINGS

A. Contractor shall evaluate the initial support system designs shown on the Drawings and shall provide additional capacity as necessary to ensure the design is fully compatible with the means and methods of construction.

B. Contractor may change the size and configuration of excavation from that shown on the Drawings to accommodate means and methods of construction, subject to approval by the Owner and to minimum requirements and any limitations included in the Contract Documents.

C. Contractor shall be solely responsible for any revision of designs shown, and for design of all connections. The design shall be prepared and sealed by a registered Professional Engineer licensed in the State of Michigan, having at least 5 years of experience designing similar support systems in similar ground conditions.

1.09 INITIAL GROUND SUPPORT SYSTEM DESIGN BY CONTRACTOR

A. Contractor shall be solely responsible for design of initial ground support systems not shown on the Drawings. The design shall be prepared and sealed by a registered Professional Engineer licensed in the State of Michigan, having at least 5 years of experience designing similar support systems in similar ground conditions.

B. Initial ground support systems shall be designed to the minimum ground loads, hydrostatic loads, and surcharge loads provided in the Geotechnical Baseline Report (GBR). Contractor shall verify that ground loads and surcharge loads for design are adequate for the expected ground conditions, and are appropriate for the type of support system proposed. Contractor shall add construction loads appropriate to the means and methods of construction.

C. Design of the initial ground support system shall consider:

1. Ground conditions described in the Geotechnical Baseline Report (GBR)
2. Methods for control of surface and ground water
3. Maintenance of soil stability at the bottom of the excavation
4. Deformation of the support system under load
5. The proximity of existing underground and above-ground structures, including buried water lines and gas lines, and the potential effect of their rupture
6. Effects of vibration on adjacent structures, from driving and pulling support elements
7. Loading conditions, including loading due to delay in adding support members, removal of support members, and dynamic loading
8. Placement of permanent lining and structures

1.10 TRENCH EXCAVATIONS

A. Protective systems for trench excavation shall conform to OSHA 29 CFR Subpart P, section 1926.652. Protective systems as defined in 1926.652 include sloping and benching systems, shield systems, and support systems.

B. Shield and support systems pre-manufactured and sold in interstate commerce may be used, provided they are selected as appropriate for the Work by a Professional Engineer licensed in the State of Michigan.

PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Liner Plates:

1. Conform with the requirements of 31 72 00, Tunnel and Shaft Initial Support Systems.

B. Steel Pile:

1. Structural steel piles shall be rolled steel sections of the weight, shape, and length shown. The material in steel piles shall be structural steel meeting the requirements of ASTM A572/A572M or ASTM A690/A690M. The minimum yield point shall be 50,000 psi.

2. Splices in steel piles shall be made by a full penetration butt weld of the entire cross section. Care shall be taken to properly align adjacent sections so that the axis of the pile will be straight. Splices in the top 10-feet of the piles will not be permitted. All welding shall be performed by qualified welding operators.

C. Timber Lagging:

1. Wood graded for an extreme fiber stress of at least 1,000 psi. Timber dimension shall be 4”x6” nominal with maximum 8’-0” long. The material of Timber lagging shall be Spruce-Pine-Fir, Mechanically Graded or equal.

D. Internal Bracing System:

1. Structural steel: The material in walers, struts, pile bracing, points, caps, and splices shall be structural steel as follows.

a. Wide Flange Shapes: ASTM A992/A992M

b. Other Shapes, Plates, Bars: ASTM A36/A36M

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

2. Structural HP Shapes: ASTM A572/A572M, Grade 50

a. HSS: ASTM A500/A500M ,Grade B

3. Bolts for connections shall be ASTM F3125/F3125M, unless indicated otherwise. Bolts used to connect dissimilar metals shall be ASTM A193/A193M and ASTM A194/A194M, Type 316 stainless steel.

E. Structural members shall be furnished full length without splices unless otherwise indicated or approved by the Owner.

F. Cement-Bentonite Slurry:

1. Portland Cement: ASTM C150/C150M, Type I or Type II.

G. Slurry:

1. Refer to Specification Section 31 56 00 – Slurry Walls for minimum requirements for the slurry mix.

EXECUTION

3.01 GENERAL

A. Construct initial ground support systems to line, grade, dimensions, and tolerances that allow permanent structures and pipes to be placed as shown on the Drawings and in accordance with specified tolerances. Initial support systems shall not project into the limits of the permanent structure.

B. Supplement the support system as designed to address variations in ground conditions as they are exposed in the excavation.

C. Install and remove support members following the sequence of operations shown on the Contractor's design drawings.

D. Develop and maintain firm and uniform bearing of the support system against the ground by advancing the support system in advance of excavation, by timely placement of internal supporting members, by expanding the support system tightly against the ground, or by timely backfill grouting between a non-expanding support system and the ground.

E. Periodically examine initial ground support systems in place to identify loosening or instable ground; loss of ground through the support system; or excessive deformation, overstress, or weakening of the support system.

F. Maintain the initial ground support system in fully functional condition for the duration of its use. Promptly reset, repair, or replace support system elements that settle, become misaligned, were improperly installed, or become damaged.

3.02 INITIAL GROUND SUPPORT SYSTEMS IN SOIL

A. Initial ground support systems for structure excavations in soil shall consist of steel piles (soldier piles) and wood lagging, timber sheeting and bracing, steel ribs and timber lagging, steel ribs and steel liner plates, or comparable systems.

B. Driven or vibrated sheeting shall not be used.

C. Bracing members called for in the initial ground support system design shall be installed within 5 feet of the current excavation bottom in shafts, unless otherwise shown on the Drawings.

D. Coordinate the installation of initial support systems with excavation to prevent heaving or raveling of exposed soils.

3.03 STEEL PILES

A. Install steel piles by pre-drilling or other pre-excavating methods to their proposed tip elevations. Impact and vibratory driving for steel pile installation is prohibited.

B. Contractor shall have equipment on-site able to advance the pre-excavated hole, for installation of the steel piles, through obstructions in the fill and native soils.

C. Within the same day of seating the steel piles in the pre-excavated holes, completely backfill the holes and fully encase the steel piles with concrete of class as specified in the Contract Documents from the pile tip to the ground surface.

D. After completion of structure construction and excavation backfilling, steel piles shall be left in-place and cut off at a minimum three (3) feet below finished grade, unless specified otherwise in this Section.

3.04 TIMBER LAGGING

A. Install lagging with louvered openings (gaps) between boards in accordance with ground conditions encountered in excavations and subject to the approval of the Owner. In no case will the louvered openings be allowed to exceed one (1) inch.

B. Pack louver openings between lagging with filter fabric, hay, excelsior, jute matting, or other porous material to allow free drainage of groundwater without loss of retained soil or backpacking.

C. The maximum permissible height of unlagged (unsupported) face of excavation shall not exceed three (3) feet. If water is flowing from the face of the excavation, or if soil to be retained moves toward the excavation, the maximum height of unlagged face shall not exceed eight (8) inches.

D. If unstable ground is encountered, take suitable measures (Backfill Grouting or other approved method) to retain the material in-place and prevent loss of ground or movements which may cause damage to adjacent structures or utilities.

3.05 PRE-EXCAVATION AND GUIDE WALL CONSTRUCTION

A. Before commencing cement-bentonite trench, hand or vacuum excavate as required to expose all utilities known to cross or suspected of crossing the footprint of the proposed excavation and to determine the locations of potentially unknown utilities.

B. Pre-excavation (Pre-trenching): Prior to commencing guide wall construction, the alignment of the wall shall be pre-excavated to a minimum depth of 10 feet from top of wall to remove obstructions, rubble, loose fill and unsuitable materials. The width of the pre-excavation zone shall be at least twice the thickness of the C-B wall and shall be backfilled with stable, excavatable material and meet the clean fill criteria required elsewhere in the Contract Documents. Support of pre-excavation shall be in accordance with the requirements specified elsewhere in the Contract Documents.

C. Guide walls shall be continuous, cast-in-place reinforced concrete placed on a stable subgrade. Where fill debris exists at the guide-wall bearing surface, either remove the debris or stabilize the ground to provide a stable bearing. Use suitable temporary internal bracing or other stabilizing measures as necessary to prevent guide wall movement.

D. Protection: If at any time the safety of any existing or new construction, utilities, roadways, walkways, or other facilities, shall appear to be endangered, take all necessary means to protect such structures, utilities, etc.

3.06 CEMENT-BENTONITE WALL INSTALLATION

A. Panel Excavation:

1. Layout and measure panels taking as reference the outside face of the permanent structures as shown on the Contract Drawings and including the anticipated installation tolerances.

2. Trenches shall be excavated by clamshell, hydromill, or other suitable trenching equipment. The excavating tool shall have a minimum width equal to the specified trench width.

3. Contractor shall always maintain the stability of the excavated trench for the full depth.

4. Contractor shall maintain cement-bentonite slurry in workable condition until completion of the panel excavation.

5. Any deleterious sediment that may settle out of the slurry or fall to the bottom of the trench shall be removed with the excavating tool or other suitable equipment.

6. Check the verticality of the panel during panel excavation at a minimum of 15-foot intervals and make modifications to the excavation procedures as required to maintain verticality and meet the clear dimensions shown in the Contract Drawings.

7. Take all necessary measures to prevent collapse of the excavated slurry trench prior to cement placement. In the event collapse occurs, backfill with lean concrete and re-excavate per approved method.

B. Slurry Mixing and Placing:

1. Bentonite slurry shall be prepared by mixing water and bentonite until the bentonite particles are fully hydrated and the resulting slurry appears homogeneous.

2. The cement shall be thoroughly blended into the slurry until the mix is homogeneous and the cement particles are fully dispersed in the bentonite slurry.

C. Slurry shall be introduced into the trench at the same time trenching is begun and the level of slurry shall be maintained in the trench during excavation.

1. Once the cement-bentonite slurry is introduced into the trench, excavation shall be continuous. The panel shall not be disturbed or joined with a new panel for at least 48 hours or until the hardened cement-bentonite is self-supporting.

2. Leaving a panel open over a weekend or holiday shall be allowed provided slurry levels in the panel are monitored and maintained at all times.

3. Maintain a reserve supply of mixed bentonite slurry equal in volume to 25 percent of the volume of one fully excavated panel. If panel sizes vary, the size of the slurry reserve volume shall be based on the largest panel.

D. Key:

1. Unless otherwise directed, the bottom of the slurry trench will be as shown in the Contract Drawings. The final depth and penetration of the trench shall be measured and checked by the Contractor and approved by the Owner immediately following excavation.

E. Continuity Between Trench Segments:

1. Any time that a trench segment is extended where the slurry in the previously excavated trench has set, the excavation tools will be arranged to re-excavate a minimum 24 inches overlap into the end of the previously excavated trench, measured at the ground surface.

F. Trench Top Treatment:

1. After initial slurry hardening, the top of the completed trench shall be checked for free water or surface depressions. Any free water shall be removed, and the trench shall be filled with slurry to the specified elevation. Following initial set of this additional slurry, the top of the trench shall be covered with material to prevent drying of the slurry. No cover material shall be placed until the trench has been inspected by the Contractor and the Owner.

G. Clean-Up:

1. Material excavated from the trench shall be stockpiled or disposed of per the Contract Documents. After completion of the slurry trench, the work surface shall be cleaned of all excess slurry.

3.07 INTERNAL BRACING SYSTEM

A. Install and maintain support members in tight contact with each other and with surface being supported.

B. Structural members shall be adequately braced against buckling, with factor of safety of at least 1.5 for maximum axial loading condition, including temperature effects.

C. Where required, pre-load bracing members in accordance with methods, procedures and sequence as described on accepted Shop Drawings. Coordinate excavation work with installation of bracing and preloading. Use steel shims and steel wedges, welded or bolted in place, to maintain preloading force, where required, in bracing after release of jacking equipment pressure.

3.08 REMOVAL OF INITIAL GROUND SUPPORT SYSTEMS

A. Support or bracing members shall be removed provided that the removal is sequenced with backfill operations or the construction sequence associated with casting the final lining. Rebracing shall be installed as needed and in accordance with the Contract Documents.

B. Removal of support elements shall be performed in a manner to maintain stability and strength of soils, and to avoid disturbing adjacent utilities and structures. Voids left on the removal process shall be backfilled to prevent subsidence.

C. Support elements may be left in place at Contractor’s expense and with the written approval of the Owner, provided that the top 3 feet below final grade is removed. Provide additional clearance as necessary for new or relocated utility lines or other structures.

3.09 CONTROL OF VIBRATIONS

A. Contractor shall be responsible for adverse effects of vibrations from installing the support systems, regardless of compliance with vibration and air overpressure limits specified herein. In no case shall ground vibration or air overpressure limits be exceeded.

B. Vibration limits and noise limits shall conform to requirements specified elsewhere in the Contract Documents.

C. Monitoring equipment shall conform to requirements specified elsewhere in the Contract Documents.

D. Contractor shall be responsible for monitoring noise and vibration from construction operations.

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

E. Section 32 13 13 - Concrete Paving

1.03 REFERENCE STANDARDS

A. Unless otherwise specified, the Work for this Section shall conform 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. The finished surface shall be shaped 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 shall 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 shall be performed by a testing laboratory approved by the Engineer.

1.06 STOCKPILING AGGREGATE

A. Aggregate shall be deposited in stockpiles in such a manner that the material may be removed from the stockpile by methods which will provide aggregate having a 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 shall conform to Series 21 and 22, as specified in MDOT Section 902.05.

2.02 CALCIUM CHLORIDE ADDITIVES

A. Calcium chloride additives shall conform to ASTM D98 and as specified in MDOT Section 922.12.

2.03 WATER

A. Water used for compaction and dust control shall be reasonably clean and free from substances injurious to the finished product. Potable water from sources approved by Michigan State Department of Public Health 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.

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. Subgrade or subbase shall be fine graded to the cross section indicated on the Plans, and shall be thoroughly compacted prior to the placing of the aggregate material.

3.05 INSTALLATION - GENERAL

A. Width, thickness, and type of aggregate materials shall be indicated on the Plans or as directed by the Engineer.

B. No aggregate material shall be placed until the subgrade, or subbase, or existing aggregate surface has been approved by the Engineer.

3.06 INSTALLATION OF AGGREGATE BASE COURSE

A. Aggregate base course shall be placed by a mechanical spreader or other approved means in uniform layers to such a depth that when compacted, the course will have the thickness shown on the Plans.

B. The depth of any one layer, when compacted, shall not be more than 8 inches. If the required compaction cannot be obtained for the full depth of the aggregate base course, the thickness of each course shall be reduced, or, with the approval of the Engineer, adequate equipment shall be used to compact the aggregate to the required unit weight.

C. Subgrade or subbase shall be shaped to the specified crown and grade and maintained in a smooth condition. If hauling equipment causes ruts or holes in the subgrade or subbase, the hauling equipment will not be permitted on the subgrade or subbase, but shall be operated on the aggregate base course behind the spreader.

D. Aggregate shall be compacted to at least 95% of maximum unit weight by the use of approved pneumatic-tired compaction equipment or vibratory compactors.

E. Optimum moisture content shall be maintained until the prescribed unit weight is obtained and each layer shall be compacted until the maximum unit weight is attained 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. Motor graders, trimmers or other approved equipment shall be used to shape the aggregate base course, and maintain it, until the surface course is placed.

H. When hauling material over the base course, subbase or subgrade, the Contractor shall limit the weight and speed of Contractor's equipment to avoid damage to the subgrade, subbase or aggregate base course. If the subgrade, subbase or aggregate base course becomes rutted due to the Contractor's operation, the subgrade, subbase or base course shall be removed and replaced 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 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 Contractor's expense.

3.07 MAINTENANCE DURING CONSTRUCTION

A. Aggregate base course and aggregate surface shall be continuously maintained in a smooth and firm condition during all phases of the construction operation.

B. Contractor, at Contractor's expense, shall provide additional materials needed to fill depressions or bind the aggregate.

3.08 TEMPERATURE LIMITATIONS

A. Aggregate materials shall not be placed when there are indications that the mixtures may become frozen before the maximum unit weight is obtained.

B. In no case shall the aggregate be placed on a frozen subgrade or base course unless otherwise approved by the Engineer.

3.09 TESTING

A. During the course of the Work, the Engineer may require testing for compaction or density and for thickness of material. Testing and coring required shall be performed by a testing laboratory acceptable to the Owner and approved by the Engineer. The cost for testing and coring shall be at the expense of the Owner.

B. When thickness tests are done, a minimum of one depth (thickness) measurement will be made every 400 feet per traffic lane. The lane width shall be as 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. Maximum unit weight shall be understood 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. Depths may be 1/2 inch less than the thickness indicated on the Plans provided that the average of all measurements taken at regular intervals shall be equal to or greater than 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. Locations of the depth measurements will be as specified herein unless otherwise determined by the Engineer. Sections found to be deficient in depth shall be corrected by the Contractor 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 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 certified batch plant delivery tickets prior to the placing of the materials.

C. Contractor must supply the Engineer with a certified job mix design 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

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 501except 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

Table 1 - Uniformity Intolerance Limits						
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
(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 20A or 22A aggregate.

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 between0 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. When placing the bituminous mixture in a lane adjoining a previously placed lane, the mixture will be placed such that it uniformly overlaps the first lane by 2 to 4 inches and is placed at a height above the cold mat equal to the breakdown roller depression on the hot mat.

1. The overlapping material will be bumped, back onto the hot lane so that the roller will compress the excess material into the hot side of the joint.

2. If, in the opinion of the Engineer, the overlap is excessive, excess material will be trimmed by the Contractor so as to leave an edge having a uniform thickness. The excess material will be discarded; excess material will not be spread across the surface course.

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

Table 2 - Mix Temperature Limitations			
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 BITUMINOUS CONCRETE CURB

A. Bituminous concrete 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. Bituminous concrete curb 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 approved by the Engineer.

D. Bituminous 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. Bituminous mixture 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 bituminous mixture 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 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.

3.29 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.

3.30 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 Contractor.

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.

3.31 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 Owner.

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 23 - Sodding

1.03 REFERENCE STANDARDS

A. Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications.

1. AASHTO M 33M: Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
2. AASHTO M 324: Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
3. AASHTO T 26: Standard Method of Test for Quality of Water to Be Used in Concrete
4. ASTM A615/A615M: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
5. ASTM A706/A706M: Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
6. ASTM A996/A996M: Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
7. ASTM A1064/A1064M: Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
8. ASTM C33/C33M: Standard Specification for Concrete Aggregates
9. ASTM C94/C94M: Standard Specification for Ready-Mixed Concrete
10. ASTM C143/C143M: Standard Test Method for Slump of Hydraulic-Cement Concrete

11. ASTM C150/C150M: Standard Specification for Portland Cement
12. ASTM C172/C172M: Standard Practice for Sampling Freshly Mixed Concrete
13. ASTM C260/C260M: Standard Specification for Air-Entraining Admixtures for Concrete
14. ASTM C309: Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
15. ASTM C494/C494M: Standard Specification for Chemical Admixtures for Concrete
16. ASTM C618: Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
17. ASTM C989/C989M: Standard Specification for Slag Cement for Use in Concrete and Mortars
18. ASTM D98: Standard Specification for Calcium Chloride
19. ASTM D994/D994M: Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
20. ASTM D1751: Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
21. ASTM D5893/D5893M: Standard Specification for Cold Applied Single Component Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements
22. ASTM D6690: Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
23. American Concrete Paving Association
24. MDOT: Michigan Department of Transportation, Standard Specifications for Construction, latest edition.

1.04 MATERIAL REPORTS

A. At the request of the Engineer, the Contractor shall provide the Engineer with certification that the various materials to be used conform to the Standards referred to in the Specifications.

B. The Contractor shall submit a list of his source of material supply to the for review prior to placing any order.

C. The Contractor shall provide the Engineer, prior to the actual delivery of the ready-mixed concrete, the mix design as required by ASTM C94/C94M .

1.05 THICKNESS AND COMPRESSIVE STRENGTH REPORTS

A. The testing lab shall provide the Engineer with 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 shall be performed by a testing laboratory approved by the Engineer.

1.06 WATER QUALITY TEST REPORTS

A. The testing lab shall provide the Engineer with two (2) certified copies of the test results of the quality of water to be used in the concrete. The sampling and testing of water quality shall be in accordance with AASHTO T 26 requirements, and the certification of the tests' results shall be performed by a testing laboratory approved by the Engineer.

1.07 REQUEST FOR MATERIAL VARIANCE

A. All requests for variances in the materials, as specified, shall be made in writing to the Engineer.

B. Two (2) copies of the request shall be submitted 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. Cement shall be low alkali, air-entraining Portland cement conforming to ASTM C150/C150M, Type IA or Type IIIA.

2.02 FINE AGGREGATES

A. The fine aggregate gradation shall conform to ASTM C33/C33M and to fine aggregate, 2NS, as specified in MDOT, Section 902.08.

2.03 COARSE AGGREGATE

A. The coarse aggregate gradation shall conform to ASTM C33/C33M and to coarse aggregate, 6A, or 6AA as specified in MDOT, Section 902.03.

2.04 WATER

A. Water to be used for mixing and curing concrete shall 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 Department of Public Health as potable may be used without testing.

C. Water requiring testing shall be tested in accordance with the current Method of Test for Quality of Water to be used in Concrete, AASHTO T-26, and specified in MDOT, Section 911.

2.05 CONCRETE ADMIXTURES

A. Air-Entraining Admixtures

1. Air-entraining admixtures for concrete shall conform to ASTM C260/C260M and as specified in MDOT, Section 903.01.

B. Concrete Accelerators

1. Chemical admixtures, other than calcium chloride, for accelerating the set of Portland cement concrete shall conform to ASTM C494/C494M, Type C or Type E.

2. Calcium chloride in flake or pellet form shall conform to ASTM D98, Type S, Grade 1 or grade 2, flake or pellet form, and as specified in MDOT, Section 903.04.

3. Calcium chloride in solution form shall conform to MDOT, Section 903.04.

C. Water-Reducing and Water-Reducing Retarding Admixtures

1. Water-reducing admixtures and water-reducing retarding admixtures shall conform to ASTM C494/C494M, Type A or Type D, except that neither type of admixture shall contain calcium chloride, and as specified in MDOT, Section 903.02.

D. Pozzolanic Admixtures

1. Fly Ash shall conform to ASTM C618, Type F, and as specified in MDOT, Section 901.07.

2. Ground granulated blast furnace slag shall conform to ASTM C989/C989M, Grade 100, minimum

2.06 CONCRETE CURING COMPOUNDS

A. White membrane curing compound for curing concrete shall conform to ASTM C309, Type 2, Class B Vehicle, and as specified in MDOT, Section 903.06.

B. Transparent membrane curing compound for curing base course concrete shall conform to ASTM C309, Type 1-D, Class B Vehicle, and as specified in MDOT, Section 903.06.

2.07 LANE TIE BARS

A. Bar reinforcement for pavement tie bars shall conform 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. Welded steel wire fabric for concrete mesh reinforcement shall conform to ASTM A1064/A1064M, and as specified in MDOT Section 905.06, and shall be fabricated as shown on the Plans.

2.09 DOWEL BARS

A. Dowel Bars and basket assemblies for Transverse expansion and contraction joints shall be ASTM A615/A615M Grade 40 and conform to MDOT Section 914.07.

2.10 STEEL HOOK BOLTS

A. Hook bolts shall conform to ASTM A706/A706M, or Grade 60 of ASTM A615/A615M, or ASTM A996/A996M. Hook bolts shall be 5/8 inch diameter. Along the edge of existing concrete, expansion anchored hook bolts shall be used.

2.11 JOINT FILLERS

A. Fiber joint filler material for expansion joints shall conform to ASTM D1751, and as specified in MDOT, Section 914.03.

B. Bituminous premolded joint filler material shall conform to ASTM D994/D994M and also AASHTO M 33M.

C. Polyethylene premolded joint filler for pressure relief joints shall be a flexible, low-density, expanded, extruded polyethylene plank. The polyethylene plank shall be formed by the expansion of polyethylene base resin in an extrusion process and shall be homogeneous, closed-cell and multi-cellular.

2.12 JOINT SEALANTS

A. Hot-poured type joint sealant shall conform to AASHTO M324 or ASTM D6690 Type II and as specified in MDOT, Section 914.04.

B. Cold-applied, single component type, joint sealant shall conform to ASTM D5893.

2.13 CONCRETE MIX

A. Concrete shall yield 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.

B. Mixes shall be a nominal 564 lbs/cyd mix except that a minimum of 25% Type F Fly Ash shall be used in the mix. Contractor shall provide documentation from actual mixes used on projects showing 28 day compressive strength of not less than 3500 PSI when tested under field conditions.

1. Water reducers, additional fly ash, ground granulated blast furnace slag (GGBFS), and other pozzolans, may be used when approved by the Engineer. The fly ash quantity may not exceed 40%; GGBFS quantity shall be not less than 25% not more than 40%.

2. Maximum total replacement of cement shall not exceed 40%. GGBFS and Fly Ash must replace cement on a pound for pound basis.

C. Cement shall be air-entraining Portland cement ASTM C150/C150M, Type IA. If high-early strength concrete is desired, Type IIIA is required.

D. High early strength concrete shall be 4500 PSI, 658 lbs/cyd with a water reducer. Water cement ratio shall be between 0.38 and 0.39.

E. The air content of the concrete shall be dependent 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. The slump of the concrete shall be between 1-1/2 to 2-1/2 inch where machine methods are used for striking off and consolidating the concrete. If the Engineer permits hand finishing, the slump may be increased to 3-1/2 inch.

G. Ready-mixed concrete shall be in accordance with ASTM C94/C94M, Alternate 2, and shall yield 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. The Engineer shall be provided 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 all excavation and compacted subgrades are adequate to receive the concrete to be installed.

B. Correct all 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 the 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 the Engineer.

3.04 BATCH PLANT

A. An adequate site for the batch plant shall be obtained by the Contractor, at his expense. The site shall be maintained, and the plant operated in accordance with the conditions and requirements established by the community in which the plant is located.

3.05 FINE GRADING

A. The subgrade shall be fine graded to the cross section shown on the Plans and shall be thoroughly compacted prior to the placing of forms or concrete.

3.06 INSTALLATION - GENERAL

A. The width, thickness, and type of concrete pavement shall be specified on the Plans or as approved by the Engineer.

B. At street intersections, curb drops, conforming to the current rules and regulations of Act 8, Michigan PA 1973, shall be provided for the construction of sidewalk ramps.

C. Curb drops for sidewalk ramps and driveway approaches shall be provided as specified in locations called for on the Plans or as approved by the Engineer.

D. Construction operations shall be restricted to the existing right-of-way. If additional area is required, the Contractor shall furnish the Engineer with written permission from the property owner for any part of the operation he conducts outside the established right-of-way.

E. Contractor shall maintain traffic access at all intersections. Vehicle access shall also be maintained to all commercial and public properties and elsewhere as designated by the Engineer.

3.07 FORMS

A. Except when paving with a slip-form paver, forms shall be used and shall be made of metal, having an approved section, which shall insure their rigidity under impact, thrust and weight of the heaviest machine carried on them. The thickness of the metal shall be not less than 1/4 inch, except that a minimum thickness of 3/16 inch will be permitted if the form is a trapezoidal cross section.

B. Forms shall have a minimum length of ten 10 feet and a depth not less than the edge thickness of the Work prescribed, except the subgrade may be a maximum of 1 inch lower than the bottom of the forms when approved by the Engineer. The width of the base in direct bearing on the soil shall be not less than 0.75 of the form depth except that a width of less than 8 inches will not be permitted.

C. Each 10 feet section of form shall have at least three (3) stake pockets. The forms shall be straight, free from distortion, and shall show no vertical variation greater than 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; and shall show 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. The method of connection between form sections shall be such that a locked joint is formed free from vertical movement in excess of 1/8 inch and from horizontal movement in excess of 1/4 inch under the impact, thrust and weight of the heaviest machine carried on the forms.

F. Sufficient forms shall be provided so that it will not be necessary to remove them in less than 12 hours, or longer if required, after the concrete has been placed.

3.08 EQUIPMENT REQUIREMENTS

A. Approved, mechanical concrete placing and finishing equipment shall be used for concrete paving except for gapped areas or where otherwise approved by the Engineer.

B. The Contractor shall furnish sufficient equipment for the placing of concrete pavement. The equipment shall be on the job site and ready for normal operation before the paving operation is started. All equipment shall be in good working order. The equipment shall be subject to inspections and testing during construction.

C. The equipment shall be of sufficient capacity that the paver can operate continuously and obtain a rate of production that insures good workmanship and eliminates overloading of equipment or frequent interruptions or delays.

D. Equipment operating on or near the pavement shall be equipped with rubber-tired wheels.

E. Subgrade Roller or Compactor:

1. This equipment shall be self-propelled steel-wheeled or a pneumatic-tired roller weighing not less than 8 tons or a self-propelled vibratory compactor 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 the Engineer.

2. The steel-shod template shall be adjustable to fit the shape of the bottom of the pavement and shall have adequate connection to a rigid frame to maintain the crown.

3. The planer shall be of sufficient weight to plane off all high spots encountered.

G. Base Trimmer:

1. For slip-form construction, a powered, self-propelled base trimmer will be required. This base trimmer shall be capable of trimming the base to the required cross section.

H. Water Supply Equipment:

1. The pumps and pipe lines shall be such capacity and nature as to insure an ample supply and adequate pressure of water, simultaneously, for all the requirements of machinery, mixing, sprinkling subgrade, and all other requirements of the Work.

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. The finishing machine shall be power driven and of an approved type which will strike off and compact the concrete with a screeding and troweling action. The machine shall be capable of finishing the concrete in the manner specified herein, and shall 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 the 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. An approved concrete spreader with a strike-off board or a separate strike-off shall be used to level each layer of concrete, before placing of reinforcement, and before finishing the concrete.

a. It shall have sufficient weight and rigidity to retain its shape under working conditions to 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 the Engineer.

K. Vibratory Screed:

1. An approved hand-propelled vibratory screed shall be provided for use in gapped areas at driveways and intersections, and where machine methods are not feasible to screed and consolidate the concrete.

a. Gaps finished by this method shall be limited to one (1) joint spacing in length and one (1) single lane width.

2. The screed shall consist of a steel-shod strike board having a minimum thickness of two 2 inches and equipped with a gasoline engine capable of producing at least 5,000 vibrations per minute.

3. Other vibratory screeds may be approved by the Engineer.

L. Membrane Sprayer:

1. A mechanically-pumped pressure sprayer capable of applying a continuous uniform film of curing compound will be required.

2. The equipment shall provide adequate stirring of the compound during application.

M. Slip-Form Paving Equipment:

1. When pavement is placed by the slip-form method, the slip-form paving equipment shall spread, consolidate, screed, and mechanically float the freshly-placed concrete in such a manner that only a minimum of hand finishing will be necessary to provide a dense and homogeneous pavement.

2. The machine shall be equipped to vibrate the concrete for the full width and depth of the pavement being placed.

N. Floats:

1. The mechanical float shall be a combination float finisher. Where a mechanical float is an integral part of a slip-form paver, a separate mechanical float will not be required.

2. A float finisher shall consist of a machine having two (2) screeds and be equipped with a suspended pan float. The second screed and the pan float shall be suspended in such a manner that 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. A movable bridge shall be provided when necessary to satisfactorily finish the pavement or construct joints. The bridge shall be designed and constructed so that it will not come in contact with the concrete.

P. Transverse Float:

1. This float shall be made of metal and shall be at least 10 feet in length and of the box or channel type with a floating face at least 6 inches in width. It shall be constructed so as to be light in weight, rigid and free from warps.

Q. Vibrator:

1. The vibrator for consolidating the concrete along the faces of the forms and adjacent to joints shall be an approved electric or mechanical vibrator of an internal type, not less than 2 inches in diameter. It shall have minimum frequency of 5,000 vibrations per minute for a tube2 inches in diameter, 3,600 vibrations per minute for a tube 4 inches in diameter, or a proportionate frequency for an intermediate size.

2. At least two (2) vibrators shall be provided for each concrete paving unit on the project.

3. The vibrators used adjacent to the forms in conventional paving shall be connected with the equipment on which they are mounted such that vibration of the concrete will start automatically with the forward movement of the equipment and stop automatically whenever forward movement stops.

R. Form Tamper:

1. A mechanical form tamper of approved design will be required on all projects. It shall be capable of thoroughly and uniformly compacting the soil under the forms.

S. Strike-Off for Reinforcement:

1. An approved strike-off shall be used to level the concrete before placing the pavement reinforcement. It shall be adjustable and shall be supported by two (2) flanged wheels on each end which rest on the side forms.

2. It shall have sufficient weight and rigidity to retain its shape under working conditions and properly strike off the concrete.

3. An approved hand strike-off resting on the forms shall be used 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. When not placed on approved chairs, lane tie bars shall be installed by use of an approved mechanical device.

U. Reinforcement Carrier:

1. Reinforcement not placed on chairs shall be transferred from the hauling equipment to a movable bridge which spans the pavement being cast or placed by other approved means which will not result in contamination of the concrete.

2. The bridge shall be capable of carrying the reinforcement load without appreciably deflecting the forms.

V. Joint Filling and Sealing Equipment:

1. The equipment for filling and sealing joints shall be available for inspection and testing at least 48 hours prior to its use.

2. The sealing machine shall include a mechanical mixer capable of mixing the sealing components into a uniform, homogeneous mass.

3. The heating kettle for hot poured sealing material shall be of the indirect-heating or double boiler type, using oil as the heat transfer medium.

   a. It shall have a thermostatically controlled heat source, a built-in automatic agitator, and thermometers installed to indicate both the temperature of the melted sealing material and that of the oil bath.

   b. Contractor shall demonstrate that the equipment proposed for use will consistently produce a joint sealer of proper pouring consistency.

4. The hot-poured sealing material shall be applied directly from the heating kettle; the kettle shall be equipped with a pressure pump, hose and nozzle suitable for forcing the sealing material to the bottom of the joint and completely filling the joint.

   a. The rate of application shall be controlled so as to completely fill the joint and not spill the material on the surface of the pavement.

   b. The hose and nozzle shall maintain the temperature of the sealing materials so that the loss in temperature is not more than 10 degrees F between the nozzle and the heating tank.

   c. Heat from a direct flame on the nozzle shall not be used to maintain the proper temperature of the sealing material.

   d. The heating equipment shall be mounted on rubber-tired wheels, and only rubber-tired equipment shall be used to move the heating equipment on the pavement.

5. Cold applied sealing compound shall be applied by means of pressure equipment that will force the material to the bottom of the joint and completely fill the joint without overflowing onto the surface of the pavement.

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. Sandblasting equipment shall be of proper size and capacity to obtain the cleaning specified and shall operate at a nozzle pressure adequate for the performance of the Work.

2. Nozzles shall be of proper diameter in relation to the width of joint and shall be replaced as necessary due to enlargement by wear.

3. A power wire brush may be used in place of sandblasting equipment.

Y. Air Compressors:

1. Air compressors shall be portable and capable of furnishing sufficient air to maintain a nozzle pressure adequate to remove all loose fragments of concrete and foreign material from the joints.

2. Suitable traps shall be employed to maintain 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. Two (2) self-propelled concrete saws which are adequately powered to cut hardened concrete to a minimum depth as shown on the Plans will be required. The minimum thickness of the saw blade shall be 3/16 inch.

2. Saws shall be equipped with suitable guards.

BB. Miscellaneous Equipment:

1. All other small tools to completely and satisfactorily finish the Work, including straightedges for testing pavement and forms, shall be provided by the Contractor.

3.09 PLACEMENT OF FORMS

A. Forms shall be placed and checked for line and grade at least 500 feet in advance of placing concrete.

B. Forms shall be adequately staked and braced to resist the pressure of concrete and the thrust of the equipment.

C. Forms shall 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. Forms shall be thoroughly cleaned before they are placed.

F. Forms shall be neatly and tightly joined, and shall be securely staked by at least three (3) stakes per form.

G. Forms shall be oiled before concrete is placed against them.

H. Forms shall be checked for line and grade, after being set.

I. Forms showing a variance from the staked line by more than 1/4 inch or from the staked grade by more than 1/8 inch in 10 feet shall be adjusted.

J. Where the use of flexible forms are required, sufficient back bracing shall be provided to prevent undue deflection of the forms during placement of the concrete.

3.10 PLACING CONCRETE

A. Placing of concrete should not commence or continue until the condition of the subgrade has been approved by the Engineer.

B. The concrete shall be spread or distributed as soon as placed. If a mechanical spreader is not used, the concrete shall be deposited in a manner that requires a minimum of re-handling to avoid segregation and separation of materials. The concrete shall be deposited to a height sufficiently above grade so that when consolidated and finished it shall conform to the required finished grades.

C. Concrete along the faces of forms and adjacent to joints shall be consolidated and compacted to fill all voids.

D. Forms shall not be vibrated 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. The equipment shall vibrate concrete placed full depth for the complete width and depth of the pavement being placed. For concrete placed in two (2) layers, only the second layer will be required to be vibrated.

G. The placing of concrete shall be continuous as much as possible between transverse joints.

H. Whenever a temporary halt in operation occurs, the concrete and unfinished end of the slab shall be covered with wet burlap or plastic.

I. If the interruption of Work continues for more than 20 minutes, a construction joint shall be placed, provided the proposed construction joint is 15 feet or more from the last joint for reinforced pavement and at last 10 feet or more from the last joint in plain concrete pavement.

    1. Sections of pavement shorter in lengths will not be permitted and, if constructed, shall be removed and replaced at the Contractor's expense.

J. Integral curbs, where specified or required, shall be constructed monolithic with the pavement slab. The curb material shall be placed before the pavement has started its initial set and shall be of the same mix as the concrete pavement.

K. Base and back forms will be required when constructing straight curbs, and back forms with templates of the required curb shape shall be used when constructing rolled and mountable curbs. The curb concrete shall be spaded sufficiently to eliminate all voids and tamped to bring the mortar to the surface, after which the curb shall be given a final finish to match the texture of the pavement.

L. After removing forms, any visible areas of honeycomb or minor defects shall be immediately filled with mortar, having one part of Portland cement and two parts fine aggregate, and shall be applied with a wooden float.

M. Where adjacent pavement lanes are constructed in separate pours, no equipment shall be operated upon recently placed concrete until the pavement has attained at least 85% of the design strength as determined by testing cores taken from the project, or until the pavement is 14 days old, at the option of the Engineer.

N. Any equipment wheels operating on the pavement, shall operate at least 1 foot from the edge of the pavement. The equipment wheels shall be rubber-tired.

O. The paver shall not be permitted on the new slab until the pavement has attained full design strength. The paver shall not operate on any new slab without using wood mats having an approved thickness and width to insure that the pavement will not be marked or structurally damaged.

P. Pavers are not permitted to operate on residential streets.

Q. If the curing compound is damaged, it shall be repaired by spraying additional curing compound on the damaged areas as soon as the Work is completed.

R. The filler strip on pavement widening projects shall be poured as soon as possible but not later than the first working day following the placing of the slab.

S. At all intersections and where access is required to property along the Project, construction shall be completed by gapping the proposed pavement. Load transfer, contraction, or end-of-pour joint devices shall be placed at the gapped ends of the pavement.

T. In lieu of pavement gapping, the Contractor may elect to place a temporary bridge, of a design approved by the Engineer, to provide access. Furnishing, placing, maintaining, and removing the bridge shall be at the Contractor's expense.

3.11 PLACING PAVEMENT REINFORCING

A. Where reinforcement is required, the sheets or mats shall be placed at the depth below the surface of the finished pavement, as shown on the Plans.

B. Pavement reinforcement shall be shipped and delivered to the Work in flat sheets or mats.

C. Adjacent sheets or mats shall be lapped, as indicated on the Plans, and shall be fastened to each other in no less than two (2) places in each pavement lane.

D. Where the width of pavement varies, the reinforcement requirements shall be the same as called for on the Plans. Split sheets or mats may be used to conform to the particular pavement configuration. Side laps shall not be less than the spacing of the longitudinal wires or bars.

E. On widening Projects where the pavement slab is less than 6 feet in width, 1/2 inch diameter longitudinal reinforcing bars may be substituted for standard reinforcement, providing the bars are spaced not more than 12 inches center-to-center. The first bar shall be not more than 3 inches from the edges of the widened slab, and the bars shall be lapped a minimum of 12 inches.

F. Reinforcement shall be installed by one of the following methods:

1. Chairs upon which reinforcement is to be mounted shall support the reinforcement and shall have such bearing on the base that there will be no undue penetration of the base. The maximum spacing of the chairs shall be sufficient to maintain the reinforcement at the specified depth. The reinforcement shall be placed directly from the hauling unit unto the chairs.

2. When reinforcement is placed between two (2) layers of concrete, the first layer shall be mechanically spread and struck off to the required depth below the proposed finished surface. The reinforcement shall be placed directly from the carrier onto the struck off concrete.

3. Any area where the use of the mechanical spreader or mechanical strike-off is not feasible, the reinforcement shall be mounted on chairs.

3.12 JOINTS

A. All longitudinal and transverse joints shall conform to the details and shall be constructed at the locations shown on the Plans or as directed by the Engineer.

B. All joints shall be constructed true to line with their faces perpendicular to the surface of the pavement.

C. Transverse joints shall be constructed at right angles to the centerline of the pavement, unless otherwise called for on the Plans or as determined by the Engineer. The joints shall not vary more than 1/4 inch from a true line.

D. The surface of the pavement adjacent to all joints shall be finished to a true surface. Where indicated on the Plans, joints shall be edged to the radius shown or a minimum 1/4 inch radius. The surface across the joints shall be tested with a 10 foot straightedge as the joints are finished and any irregularities shall be corrected before the concrete has hardened.

E. When pavement is laid in partial width slabs, transverse joints in the succeeding slabs shall be placed in line with the like joints of the first slab. In the case of widening existing pavements, transverse joints shall be placed as shown on the Plans, or as directed by the Engineer.

F. Keyways, where required, shall be accurately formed with templates of metal, wood, or paper securely pinned in place. The gauge or thickness of the material in the templates shall be such that the full keyway, as specified, is formed in the correct location.

G. Longitudinal Joints:

1. Longitudinal joints shall be a longitudinal lane tie joint with tie bars or a bulkhead construction joints with hook bolts. Where called for on the Plans a keyway shall be constructed in the bulkhead construction joint.

a. Longitudinal Lane Tie Joint (D):

1) Longitudinal lane tie joints with tie bars shall be planes of weakness formed by sawing a groove in the hardened concrete according to the alignment, width and depth shown on the Plans.

2) Tie bars of the type, diameter and length called for on the Plans, shall be placed at the required depth parallel to the finished surface, at right angles to the joint and at the uniform spacing also called for on the Plans or as approved by the Engineer.

3) Bar chairs shall be used to support the lane tie bars or the lane tie bars may be installed by use of a mechanical device, approved by the Engineer. The placing of lane tie bars in the concrete by hand methods will not be permitted.

4) The joint shall be sawed as soon as the concrete will not spall or not more than three (3) days after placement, and shall be completed before traffic of any kind uses the pavement. Immediately following the sawing of the joint, the slurry resulting from the sawing operation shall be completely removed from the joint, and the immediate area by flushing with a jet of water under pressure.

5) The joint shall be blown out with a jet of compressed air to remove the flushing water.

(a) After the joint is dry it shall be cleaned out with a jet of compressed air with a working pressure of at least 90 psi and then shall be sealed in accordance with these specifications with an application of an approved hot or cold applied type joint sealing compound.

(b) The sealing compound shall be applied with approved pressure type equipment with the nozzle extending into the groove and the groove shall be filled until the sealer overlaps the pavement about 1/8 inch.

b. Longitudinal Bulkhead Construction Joint (D):

1) Longitudinal bulkhead construction joints with hook bolts shall be used in part-width construction of concrete pavement and elsewhere as shown on the Plans, or as approved by the Engineer. The size, spacing, and depth of the hook bolts below the surface of the pavement shall be as shown on the Plans.

2) For slip-form paving, lane ties of an approved type may be substituted for hook bolts and shall be spaced at 30 inch centers, unless otherwise indicated on the Plans.

(a) Lane ties for slip-form paving shall be placed in the concrete with a pneumatic powered installer or equipment producing equal results.

(b) Lane ties, which are not set with adequate consolidation of the concrete or are not within 30 degrees of being perpendicular to the pavement edge in a horizontal plane, shall be replaced with drilled-in expansion-anchored lane ties.

3) Where a bulkhead joint is to be constructed, hook bolts and couplings shall be attached to the forms and shall be held in position during the placing and finishing of the concrete so as to permit the removal of the pavement forms without damage to the concrete or hook bolt assembly. The ends of the couplings shall be protected so that the concrete, dirt or other materials cannot enter the couplings and prevent a satisfactory connection with either hook bolt.

4) Where hook bolts or lane ties are installed for use in future pavement widening, in curb, or curb and gutter construction, a rust preventive oil shall be inserted into the open end of the couplings immediately after removal of the pavement forms by means of a hand operated pump in sufficient quantity to completely cover the internal threads.

(a) After application of the protective oil a neoprene or plastic plugs shall be inserted into the ends of the couplings to completely seal the opening without protruding outside of the couplings more than 3/8 inch.

5) The concrete shall be edged with a tool having the radius of curvature and depth of lip shown on the Plans. The second pour of concrete shall be edged with a longer lipped edging tool than that used on the first concrete pour.

6) After the concrete has cured for the required time, all extraneous material shall be removed from the joint and the joint then sealed with an approved hot-poured or cold-applied elastic-type compound. The use of sandblasters and a jet of compressed air will be required to clean the joint before sealing.

H. Transverse Joints:

1. Transverse joints shall be 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) Contraction joints shall consist of a load transfer unit and a joint groove formed by sawing. Contraction joints shall be constructed as indicated on the Plans and shall be spaced a maximum of every 57' - 3" or as provided for elsewhere.

2) The load transfer unit shall be epoxy coated dowel bars, spaced and arranged in the positions indicated on the Plans, accurately held in place by an approved metal device so as to be perpendicular to the plane of the cross section of the pavement and parallel to the centerline at a depth from the surface equal to 1/2 the thickness of the slab.

3) This device shall consist of connected transverse and longitudinal members arranged to hold each dowel so firmly that its final position after concreting operations shall not vary more than 1/8 inch per foot of length from its designated line and grade. The device shall permit the joint to be completely assembled alongside the Work, and it shall be sufficiently rigid so that the joint can be lifted into place on the subgrade as a unit.

4) One end of each dowel bar shall be free to move in the slab as the concrete contracts and expands.

(a) To accomplish this, 2/3 the length of each dowel shall be thoroughly lubricated with liquid asphalt. The liquid asphalt coating shall be applied to a sawed end of the dowel bar or, in the case of dowel bars with sheared ends, a metal cap shall be placed on the coated end of the dowel bar.

(b) The asphalt coating shall be sufficiently dry before using the dowels so that it will not be removed by handling and placing the dowels in the joint.

(c) The bars shall be installed so that the alternate bar on each side of the joint shall be the coated end of the bar.

b. Plane of Weakness Joints (WT):

1) Plane of Weakness joints shall be placed in plain concrete pavements only and is to be constructed immediately after the finishing operation has been completed. A groove shall be formed in the plastic concrete with a metal forming bar to the depth indicated on the Plans.

2) A premolded bituminous filler strip shall be placed in the groove formed by the metal bar, from a bridge operating on the pavement forms.

3) The concrete shall then be floated against the sides of the filler, and the joint edged to a 1/8 inch radius.

c. Plane of Weakness Joint for Concrete Base Course (WTB):

1) Dummy joints shall be placed in reinforced concrete pavements only where called for on the Plans.

2) They shall be constructed immediately after the finishing operation has been completed by forming a groove in the plastic concrete with a metal forming strip into which expanded polystyrene or other approved temporary filler is placed.

3) The material shall be installed flush with the surface of the pavement and the area on both sides of the joint shall be finished. Transverse joints with a temporary filler shall not be edged.

4) The pavement reinforcement shall be continuous through this joint.

d. Expansion Joints (E) and (E1):

1) Expansion joints (E1) shall consist of a load transfer unit and a premolded fiber filler and shall be used on reinforced concrete pavements or where shown on the plans.

2) Expansion joints (E) shall consist of a premolded fiber filler without the load transfer unit and shall be used for joints in concrete capping, end connections with structures or existing pavements, plain concrete pavements, and other places where shown on the Plans or where installation of the load transfer unit is not feasible; as approved by the Engineer.

3) The load transfer units shall be assembled and the epoxy coated bars lubricated with liquid asphalt. The liquid-asphalt-coated end of each bar shall be provided with a close fitting metal cap.

4) The fiber filler shall extend the full depth and width of the joint.

(a) After installation, the top shall be not less than 1/2 inch and no more than 1 inch below the finished surface.

(b) It shall be furnished in lengths not less than the lane widths being poured. Where additional partial lengths are necessary, the minimum length of load transfer unit and premolded fiber filler shall be sufficient to span two (2) dowel bar spacings.

(c) Where more than one (1) section is allowed and used in a joint, the sections shall be securely joined together.

5) For expansion joints in curb lanes with integral curb or separate curb and gutter, the fiber filler used in the pavement shall extend completely through the curb section. The fiber filler placed in the curb above the slab shall be 1 inch in width.

6) During installation, the joint shall be held in place by an approved installing device which shall be securely staked.

(a) The top edge of the filler shall be protected, while the concrete is being placed, by a metal channel cap of at least 10-gage material having flanges not less than 1-1/2 inches in depth.

(b) The channel cap shall be shaped to the proposed crown of the pavement and shall extend over the full length of the filler.

e. Pressure Relief Joints (PR):

1) The method of constructing a pressure relief joint shall be as indicated on the Plans.

2) The pressure relief joint material shall be a flexible, low-density, expanded, extruded polyethylene plank. This joint material shall be cut off to 1/2 inch below the top of the pavement surface and shall extend 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) End of pour joints in reinforced pavement shall be formed by placing a bulkhead and installing a load transfer device, as specified for contraction joints, except that the ends of the dowel bars shall not be lubricated. The load transfer device shall be so installed that each dowel bar will be embedded in the concrete for 1/2 of its length.

2) When the next pour is made, a space for hot-poured rubber joint filler shall be provided by placing a temporary filler in the fresh concrete.

3) End-of-pour joints shall be constructed using 2-piece dowels and a bulkhead, and shall be placed where it is anticipated that three (3) days or more will elapse between the casting of adjacent pours.

4) Construction joints and end-of-pour joints shall be sealed as specified for transverse contraction joints.

5) End of pour joints in plain concrete pavements shall be formed 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) The pavement across the end of both slabs shall be thickened and the joint shall be edged and sealed.

2. All transverse joints in a concrete pavement shall extend entirely through the integral curb or separate curb and gutter. The material used to construct the joint in the curb shall be of the same kind as provided for the pavement.

3. Bituminous fiber filler shall be used to construct the expansion joints in the integral curb of reinforced concrete pavements.

    a. The thickness of the fiber filler material in the curb above the gutter shall be 1 inch.

    b. The joint material shall be precut so as to conform to the geometric shape and cross-sectional area of the curb, and shall be placed in intimate contact with the filler material in the pavement.

I. The edges of all transverse joints in the integral curb shall be rounded with an approved finishing tool, having a radius of 1/4 inch.

3.13 CONSOLIDATING AND FINISHING

A. The sequence of operations after the placing of concrete shall be:

1. Striking off and consolidating
2. Floating
3. Edging
4. Final finishing with burlap drag

B. Mechanical methods shall be employed to strike off and consolidate or compact the concrete, except in gapped areas or where the pavement width will not permit the use of machine methods. Gaps less than one (1) joint opening in length may be finished by hand methods, provided 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. At least 4 inches of concrete above the finished pavement grade shall be maintained ahead of the screed for its entire length.
2. In consolidating the surface of the pavement, on residential street construction when a single screed finishing machine is used, it shall operate over each section of the pavement twice.
3. Only sufficient mortar shall be worked to the surface to provide a dense smooth finish.
4. Excessive operation of the machine over a given area will not be permitted. Segregated particles of coarse aggregate which may collect in front of the screed shall be thoroughly mixed by hand with the mass of concrete already on the subgrade.

D. If it is not possible to use mechanical equipment on irregular areas, an approved, self-propelled vibratory screed shall be employed to strike off and properly consolidate the concrete surface to the required finish grade.

1. The entire area of the pavement shall be consolidated to insure 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. Strike-off boards shall be moved forward with a combined longitudinal and transverse motion, with neither end raised from the side forms during the process.

b. A slight amount of excess concrete shall be kept 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. After striking off and consolidating, the surface shall be made uniform by longitudinal or transverse floating by a mechanical method unless the pavement is permitted to be constructed in single lane widths.

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. When mechanical equipment is not used for floating, a transverse float at least 10 feet in length shall be operated across the pavement by starting at the edge and slowly moving to the center and back again to the edge. The float shall then be moved ahead 1/2 of its length and the operation repeated.

I. Care shall be taken to preserve the crown and cross section of the pavement.

J. The float finishing operation shall not proceed until the concrete has attained a consistency so that no excess concrete is carried ahead of the float but the entire surface can be floated and sealed.

K. Immediately following the float finishes and while the concrete is still plastic, the Contractor shall test the slab surface for trueness by means of a 10 foot straightedge or acceptable float.

1. The straightedge shall be placed at the center of the slab with the blade parallel to the centerline and pulled slowly and uniformly to the edge. This operation shall be repeated until the surface of the concrete is free from irregularities and makes contact at all points with the bottom of the straightedge. The straightedge shall then be moved forward 1/2 its length and the operations repeated.

2. Depressions found in the surface shall be filled with fresh concrete and consolidated by floating with a long-handled float not less than 10 foot in length. This float may also be used to smooth sections of the surface that may have become rough or torn by dragging with the straightedge.

L. For pavement constructed by the slip-form method, the edge settlement shall be determined as soon as practical after paving operations begin. Edge settlement in excess of 3/8 inch shall be corrected before the concrete has hardened.

1. When edge settlements in excess of 1/4 inch persist, paving shall be suspended and operational corrections made before the Engineer will permit the resumption of paving. If the Contractor consistently fails to construct pavement within these tolerances, the use of slip-form methods shall be discontinued and pavement placed by means of conventional forms.

2. When paving is accomplished by the slip-form paving method, all mortar paste shall be wiped from the sides of the slab.

3. The surface shall then be tested for smoothness with the straightedge. During this operation, the contact of the straightedge with the concrete shall be uniform over the entire length tested. At the time of testing, the surface shall be free from soft mortar or excessive water. The testing straightedge shall be used for this purpose only.

M. Where the float finisher method is not utilized, as soon as the hand floating is completed, all laitance, surplus water, and inert material shall be worked entirely off the pavement and the surface made smooth by dragging with a rigid straightedge 10 foot in length and the surface shall be tested.

N. As soon as all excessive moisture has disappeared and while it is still possible to produce a uniform surface of gritty texture, the pavement shall be finished 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.

1. The burlap or cotton drag shall be pulled by a bridge supported on a pavement forms. The fabric shall be renewed as often as necessary to obtain the required texture.

O. Immediately after the initial finishing with burlap, the edges of the slab and all specified joints shall be finished with an edging tool to the radii indicated on the Plans. The pavement shall then be given a final finish by dragging the damp burlap or cotton fabric over that portion of the pavement disturbed by the edging operation.

3.14 SURFACE REQUIREMENTS

A. High spots in the surface, exceeding 1/8 inch from the straightedge but not more than 1/2 inch in 10 feet shall be removed or reduced by rubbing with a carborundum brick and water until contact with coarse aggregate is made. If contact with coarse aggregate is made before reaching an acceptable tolerance, such high spots shall be removed by an approved surface-grinding machine before acceptance of the pavement.

B. High spots in excess of 1/2 inch in 10 feet will be evaluated by the Engineer and if the Work is rejected, it shall be removed and replaced at the Contractor's expense.

C. Contractor shall take immediate steps to eliminate the cause of the defective surface.

3.15 CURING

A. After the finishing operations have been completed and immediately after the free water has left the surface, the surface of the slab shall be completely coated and sealed with a uniform layer of white membrane curing compound.

B. The compound shall be applied in a continuous uniform film by means of mechanically pumped pressure sprayer equipment at a rate of 1 gallon per 200 sft of surface. The curing compound shall not be thinned.

C. The equipment shall provide adequate stirring of the compound during application. The equipment for applying the compound must be on the Project and approved by the Engineer before Work is started.

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, the Contractor will be required to apply a new coat of material to the affected areas.

F. The treated surface shall be protected by the Contractor from injury for a period of at least seven (7) days. All traffic, either foot or otherwise, will be considered as injurious to the film of the applied compound. A minimum of foot traffic will be permitted on the dried film as necessary to properly carry on the Work including the removal of any high spots, provided any damage to the film is immediately repaired by the application of a second coat of the compound.

G. Immediately after the forms are removed, the entire area of the side of the slab shall be coated with the curing compound at the rate specified for the pavement surfacing.

H. The Contractor shall provide on the Project sufficient burlap or polyethylene coverings for the protection of the pavement in case of rain or breakdown of the spray equipment. Failure to provide proper curing will be considered as sufficient cause for immediate suspension of the concreting operations.

3.16 REMOVAL OF FORMS

A. Forms may be removed from freshly placed concrete after it has set for 12 hours, provided it can be done without damage to the pavement or curb edge. If during form removal the pavement or curb edge is being damaged, the form removal shall cease until the concrete has attained greater strength.

1. The period of time for removing forms may be increased or decreased when approved by the Engineer.

B. Immediately after removal of the forms, the ends of all joints shall be cleaned, and any visible areas of honeycomb or minor defects shall be filled with mortar, composed of 1-part Portland cement and two (2) parts fine aggregate from the same source as used in the pavement, applied with a wooden float.

1. Immediate steps shall be taken by the Contractor to correct the conditions contributing to these defects.

C. The sides of the pavement shall be sprayed with curing compound immediately upon removal of the forms, except where honeycombed areas are to be pointed, and then immediately cured.

D. Forms and pins shall not be placed on new pavement that is being cured with membrane.

3.17 SAWING JOINTS

A. Contraction joints, longitudinal lane-tie joints with tie bars, and end of pour joints shall be sawed.

B. Joints shall be sawed before any traffic is permitted 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. At least two (2) approved concrete saws shall be available for use at all times, and one saw shall be capable of sawing a joint groove 2-1/2 inch deep.

D. The saw cut for transverse end-of-pour joints shall be made to receive the joint sealing material.

E. Longitudinal lane-tie joints with the tie bars shall be sawed in accordance with the alignment and dimensions indicated on the Plans.

F. For joints formed in one operation, the joint groove shall be sawed before any transverse cracks develop. Raveling or spalling along the joint shall be repaired as specified elsewhere in this Section.

G. Transverse contraction joints shall be sawed in two stages:

1. Stage 1 Sawing:

a. The first stage shall be a relief cut directly over the center of the load transfer assembly. The initial relief cut shall be made as soon as the saw can be placed on the freshly poured concrete, and the sawing shall continue as long as the pavement can support the saw without making or appreciably raveling of the joint.

b. When water is not used in the sawing operation, membrane curing compound shall be applied immediately.

c. When water is used in the sawing operation, the slurry resulting from the sawing operation shall be completely removed from the cut and from the immediate area by flushing with a jet of water. Additional membrane curing compound shall be applied within 12 hours after the relief cut has been made.

2. Stage 2 Sawing:

a. Second stage sawing of joints shall not start until the concrete has cured for a minimum of 48 hours. The joint groove shall be centered over the relief cut and sawed to the specified dimensions shown on the Plans plus any increase in width of the relief cut due to shrinkage or contraction. Groove width tolerance shall be ± 1/16 inch.

b. Joints sawed without the use of water shall be blown clean of all foreign material by a jet of compressed air.

c. If water was used in the sawing operation, the slurry resulting from the sawing operation shall be completely removed from the groove and the immediate area by flushing with a jet of water and then blown dry with compressed air.

H. Transverse joint grooves shall receive a final cleaning with a jet of compressed air adequate to remove all foreign material, just prior to permanent sealing.

I. If the specified seal is not installed within seven days of final sawing, the joint groove shall be temporarily sealed with a suitable material or device to prevent the infiltration of foreign material.

J. Traffic shall not be permitted over the full width joint grooves prior to the installation of either the permanent seal or temporary seal.

3.18 PATCHING JOINTS

A. General:

1. After the joints have been sawed and cleaned, they shall be inspected for spalls and voids.

2. Loose, unsound or damaged concrete shall be removed to the satisfaction of the Engineer.

3. Spalls and voids will be classified as minor, intermediate or major spalls and shall be repaired accordingly.

B. Minor Spalls:

1. Spalls or voids which have increased the specified size of the joint groove beyond any of the following limits, but less than 36 square inches, shall be repaired by patching with an approved epoxy mortar before the seal is installed.

   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. The spalled concrete surface shall be thoroughly cleaned by sandblasting, power-wire brushing, or hand-wire brushing. The patch area shall then be blown clean with a jet of compressed air.

3. A heavy polyethylene sheet or a rigid material shall be inserted into the joint groove and held tightly against the joint face that is to be patched.

4. Concrete shall be clean and dry when the epoxy resin mortar is placed. The surface shall be made free of frost by heating with a clean source of heat, approved by the Engineer, until dry. Care shall be taken not to damage the concrete by 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 the Engineer.

6. Epoxy resin compound shall be mixed in a clean metal or polyethylene container with approved stirrer operating at 250 to 500 rpm. While the epoxy resin is being mixed, the curing agent compound shall be gradually added. The mixture shall then be stirred for a minimum of three (3) minutes until it is uniform.

7. After the epoxy binder is thoroughly mixed, a small portion shall be reserved for priming.

a. Dry MDOT 2NS sand shall be uniformly blended into the balance of the mixture to give an epoxy mortar of stiff or trowelable consistency. One part of mixed binder to about 3.5 parts of dry sand, by volume, will usually give a workable mix.

8. The spalled surface shall be primed with the freshly mixed epoxy binder scrubbed into the surface with a suitable applicator to insure complete wetting and coverage of all areas to which the epoxy mortar must bond.

9. Immediately after priming, the epoxy mortar shall be placed in the spalled area and finished to the shape of the original pavement surface. If the bond coat is not tacky when the mortar is placed, a second application shall be made. The edge of the patch shall conform with the rest of the joint groove.

10. Dry MDOT 2NS sand shall be sprinkled onto the fresh epoxy mortar surface to eliminate any gloss. After the epoxy mortar has cured sufficiently so that it will not be damaged during sealing operations, the polyethylene insert shall be carefully removed.

11. Joints shall receive a final cleaning with a jet of compressed air to remove foreign material.

12. When the temperature of the air and the pavement is above 50 degrees F, the hot poured elastic type joint seal may be placed on the day following the placing of the epoxy resin mortar patch. When the temperature of the air and the concrete is below 50 degrees F, the time of curing required for the epoxy mortar shall be as determined by the Engineer.

C. Intermediate Spalls:

1. Spalls larger than 36 square inches, but not extending below the reinforcing mat, shall be repaired by sawing and chiseling out the unsound concrete and patching with Portland cement mortar.

2. A saw cut at least 1 inch deep shall be made parallel to the joint groove at the outer extremity of the spalled area. The concrete shall be chipped out to the saw cut so that a vertical face is present at the back of the repair area, and the two ends of the repair area shall be trimmed to approximately vertical faces.

3. The area to be repaired shall be sandblasted to remove all loose particles and then blown clean with a jet of compressed air to remove the sand and all other foreign materials.

4. The repair area shall be flushed with clean water and the excess water shall be blown out with compressed air.

5. A heavy polyethylene sheet or a rigid material shall be inserted into the joint groove and held tightly against the joint face that is to be patched.

6. Bottom and vertical faces of the repair area shall be primed with a grout of creamy consistency made with 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. Cement grout shall be carefully applied to the rough surfaces of the spall area and shall be applied immediately prior to placing of fresh mortar so that the prime coat is wet when covered by mortar.

9. Portland cement patching material shall be tamped into the repair area and finished level to the pavement surface.

    a. Portland cement mortar shall consist of 1-part Portland cement to two (2) parts MDOT 2NS sand with a water content of not more than 4 gallons per sack of cement.

    b. A liquid air-entraining agent to maintain an air content of 8% to 11% shall be added.

    c. Calcium chloride in an amount of one (1) percent of the cement content may be added as an accelerator, if approved by the Engineer.

10. The edge of the patch at the joint face shall conform with the rest of the joint groove.

11. White membrane curing compound shall be sprayed on the patch surface immediately after the mortar is cast and finished.

12. After 72 hours the polyethylene form shall be carefully removed and all patched joints shall receive a final cleaning with a jet of compressed air to remove all foreign material.

D. Major Spalls:

1. When a joint is damaged beneath the depth of the reinforcing mat, it shall be considered a major repair. These major repairs shall be handled on an individual basis under the direction of the Engineer.

3.19 SEALING JOINTS

A. Transverse expansion, contraction, construction, and longitudinal bulkhead construction joints shall be filled and sealed with an approved hot-poured elastic type compound.

B. Longitudinal lane-tie joints shall be pressure filled and sealed with either an approved hot-poured or cold-applied elastic type compound. These sealing compounds shall not be placed when the atmospheric or pavement temperatures are less than 50 degrees F or when the weather is rainy or foggy.

C. After the shoulders are completed and the pavement has cured, the joints and pavement surfaces on each side of the joints shall be cleaned of all extraneous matter.

1. The cleaning shall be done by sandblasting or other methods approved by the Engineer that will be equally effective in cleaning the concrete.

2. The dust and sand present after the sandblasting or cleaning shall be removed by a jet of compressed air. Hand tools shall be used to remove stones and other foreign materials from the joint groove.

D. Immediately after the joints are cleaned with the compressed air, and with the surface of the concrete in the joint dry, the joint shall be sealed with an approved hot-poured elastic type compound.

E. The hot-poured compound shall be melted in an approved double boiler type kettle. Direct heating will not be permitted. Also, any sealing material heated in excess of the safe heating temperature shall not be used in the Work.

F. During the process of pouring the joints, the Engineer may, at his discretion, require that sufficient compound be taken from the melting unit to make flow tests.

G. Engineer may require the Contractor to modify his method of heating or of charging the heating unit with compound that will produce satisfactory results.

H. Pouring shall be 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. Pouring of the sealing compound shall be done so as to fill the joint to 1/4 inch below top of pavement. Any sealing compound spilled on the surface of the pavement shall be removed immediately.

K. After the first pour has cooled to the temperature of the pavement and settled, a second pour shall be made to bring the sealing compound to 1/4 inch of the surface of the pavement.

L. Traffic shall not be permitted over the poured joint until the compound has hardened sufficiently to resist pickup.

M. To protect hot-poured and cold-applied sealing compound while it is curing and to prevent pickup by traffic, the sealed joint shall be covered with a strip of paper, 1-1/2 inches wide, or other approved means, immediately following application of the compound. The paper strip shall be left 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 5000, 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. Contractor shall adequately protect the new concrete from the effects of rain before the concrete has sufficiently hardened.

B. For this Work, the Contractor shall have available on the job site at all times enough burlap or 6 mil thick polyethylene film to cover and protect one day's Work.

C. When rain appears eminent, all operations shall stop and personnel shall begin covering.

D. As soon as the rain ceases, the concrete shall be uncovered and the surface burlap dragged where necessary.

E. Curing compound shall be applied to any areas where the compound has been disturbed or washed away. Protection of the new concrete against rain shall be at the Contractor's expense.

3.22 COLD WEATHER PROTECTION

A. Any time there is a danger of freezing temperatures, the Contractor shall have available on-site a sufficient amount of clean, dry straw or hay or polyethylene film or other approved materials

to cover at least one (1) day's production. Cold weather protection shall be at the 's expense. The source of the temperature shall be taken from forecasts prepared by the local weather bureau, recognized as the Official Weather Bureau for the area the new Work is being constructed. The predicted low temperature shall be that forecast to occur during the next 24 hours.

B. Frozen material shall not be charged into the mixer at any time.

C. Frost or ice shall be removed from the forms and any steel used in the pavement, prior to placing concrete.

D. Concrete shall not be placed directly upon a frozen subgrade. The subgrade shall be covered with a layer of straw or hay 12 inches in thickness to protect it against freezing. The straw or hay shall be removed from the finished subgrade immediately ahead of paving operations and piled along the line of construction for use in covering the finished pavement. Prior to the placing of concrete, the subgrade shall be cleaned of loose straw and otherwise prepared in a manner satisfactory to the Engineer. ther covering materials as approved by the Engineer may be used to prevent subgrade freezing.

E. To accelerate hardening of the concrete when the temperature of the air in the shade and away from artificial heat is between 40 and 45 degrees F, calcium chloride shall be added to the mix at the rate approved by the Engineer. The calcium chloride shall be spread on the materials immediately before discharging into the drum of the mixer. A method approved by the Engineer, shall be used for measuring the amount of dry calcium chloride to be added to each batch of concrete. The calcium chloride shall not be placed in contact with the cement.

F. Immediately after finishing of the concrete and as soon as hardening of the concrete will permit, the pavement shall be covered and the protective covering shall remain in place until the concrete has developed a compressive strength of not less than 3,000 psi or for a minimum period of 14 days or as approved by the Engineer.

G. The protective covering shall be placed around and over the forms and it shall extend beyond the edge of the pavement for a distance at least equal to the depth of covering required.

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. The mixing and placing of concrete shall stop in sufficient time each day to permit finishing of the concrete and the placing of 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 the Contractor shall be responsible for the quality and strength of the concrete placed. Any concrete injured by frost action shall be removed and replaced at the 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, the pavement shall be protected and such protective covering shall remain in place until the concrete has developed a compressive strength of not less than 3,000 psi, or for a minimum period of 14 days, unless otherwise authorized by the Engineer.

L. Special Protection:

1. No pavement may be placed between October 15 and May 15, unless it is specifically provided for in the Contract Documents, or authorized by the Engineer, except that in no case shall concrete be placed when the predicted high temperature is to be below , without written permission of the Engineer. When paving is permitted during the period, the following requirements shall apply:

    a. The temperature of the concrete at the time it is placed on the subgrade shall be not less than 50 degrees F, nor more than 85 degrees F.

    b. In order to maintain a mix temperature between 50 and 85 degrees F the mixing water or the aggregates, or both, shall be heated as required by the Engineer. The water and the aggregates shall be heated to a temperature of not more than 150 degrees F.

        1) The heating of aggregates shall be done by the use of steam pipe under the aggregate piles, or by free steam discharged into the aggregate piles, or by steam pipe in the batching bins.

        2) The heating of the water and the aggregates shall be controlled so that there will not be any large differences in temperature from batch-to-batch.

    c. When there is any danger of the predicted low temperature dropping below 35 degrees F all the necessary materials for covering and protecting the concrete, equipment for heating the water and aggregates, when required, and calcium chloride shall be on the Project and available for immediate use for the required method of curing and cold weather protection before any pavement is placed.

    d. For predicted low temperatures from 35 to 25 degrees F either 1-layer of waterproof paper blankets or 12 inches of loose dry straw or hay shall be placed.

    e. For predicted low temperatures of 25 to 20 degrees F 1-layer of waterproof paper blankets and 12 inches of loose dry straw or hay shall be placed.

    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. When temperature are such that special protection is required as specified above, all concrete placed within the proceeding 72 hours shall be similarly protected.

3. When special protection is started, it shall be continued until design strength is reached in accordance with the above requirements unless warmer temperatures prevail for a period of at least 48 hours. Permission to eliminate special protection for such a period shall be as approved by the Engineer.

M. Protection of the new concrete against cold weather including ordinary and special protection shall be at the Contractor's expense.

3.23 CONCRETE TEMPERATURE LIMITATIONS

A. Concrete shall not be placed when the temperature of the concrete at the point of placement is above 90 degrees F.

3.24 CURB DROP

A. Curb drops shall be provided for existing and future sidewalk ramps, for approaches for existing driveways and at other locations as determined by the Engineer.

B. Curb drops for sidewalks shall be in accordance with the current rules and regulations of Act 8, Michigan PA 1973, as amended. Curb drops for drive approaches shall be centered with the existing driveway at the property line.

C. The width of the residential curb drop shall be equal to the width of the driveway determined at the property line plus four feet. Unless otherwise approved by the Engineer, the minimum width of the residential curb drop shall be 14 feet.

3.25 SHOULDERS

A. The shoulders shall be constructed according to the lines, grades, and cross section shown on the Plans and as specified for the particular type of shoulder material required. The shoulders shall be done in such sequence with the surfacing operations that they will be completed not more than seven (7) days after the expiration of the curing period, unless otherwise directed by the Engineer.

B. Aggregate shoulders, when called for, shall be constructed according to the requirements specified under Section 32 1123, Aggregate Base Courses.

3.26 CLEANUP

A. After the concrete has gained sufficient strength, but no sooner than within 12 hours, the fixed forms shall be removed and the spaces on both sides shall be immediately backfilled with sound earth of topsoil quality.

B. The backfill shall be compacted, leveled and left in a neat, workmanlike condition.

C. At a seasonally correct time approved by the Engineer, the disturbed area shall be raked, have topsoil placed thereon, and sodded in accordance with Section 32 9223, 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. Government, plat, and street intersection monuments within existing or proposed pavement shall be preserved by enclosing in standard monument boxes.

B. Monument box castings shall be furnishing and installed by the Contractor.

C. Existing monument boxes shall be adjusted to meet the proposed pavement elevation by removing the castings and resetting to the required elevation.

D. Support for the monument box shall be concrete bedding, so constructed as to hold them firmly in place.

E. The adjacent pavement, curb, or curb and gutter shall be replaced to the new elevation, condition and kind of construction, unless otherwise provided.

3.29 TESTING

A. During the course of the Work, the Engineer may require the taking of standard test cores and cylinders, by a testing laboratory acceptable to the Owner and approved by the Engineer.

B. The making of cylinders, the drilling of cores and testing shall be at the expense of the Contractor.

C. For each lane of Work:

1. A minimum of one (1) cylinder for testing compressive strength shall be made for each 500 feet, or fraction thereof, or as determined by the Engineer.

2. A minimum of two (2) cores for testing compressive strength and for checking thickness shall be drilled each 500 feet, or fraction thereof.

D. Slump tests for consistency of Portland cement concrete shall be made in accordance with ASTM C143/C143M and ASTM C172/C172M.

E. In the event the test results on a core indicates a deficiency in either thickness or compressive strength or in the event the test results on a cylinder indicates a deficiency in compressive strength, the following adjustments in the unit price for concrete shall be made based on the average of three (3) cores:

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. The area of a deficient core shall 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.

5. The extra core drilling and testing shall be at the 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 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. 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 shall be removed and replaced by the Contractor at 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 Owner 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 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. Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications:

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. Where applicable pavement markings shall conform 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.

B. ADA pavement markings will comply with State and Federal guidelines.

1.05 SUBMITTAL OF MANUFACTURER'S LITERATURE

A. Submit manufacturer's literature of all paints to be used in the Work. Manufacturer's literature shall show paint: type, texture, color, temperature limitations, recommended use, spreading rate, drying time, and cleanup.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver all materials to the Project site in original, unopened waterproof containers. Packaging containers shall bear manufacturing labels intact and legible.

B. The label shall contain the following information: name and address of manufacturer, shipping point, trade mark or trade name, kind of paint, formula, amount in U.S. gallons, date of manufacture and 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. Handling of materials shall be in accordance with the manufacturer's recommendations.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Contractor shall 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. Regular drying pavement marking paint in white and yellow colors shall comply with MDOT Section 920.

1. Regular Dry traffic paint shall be selected from MDOT’s Qualified Products List.

2.02 WATERBORNE PAVEMENT MARKING PAINT

A. Waterborne pavement marking material in white, yellow and blue colors shall comply with FS TT-P-1952 (Type I, II, or III), AASHTO MP 24 and MDOT Section 920.

1. Waterborne pavement marking paint shall be selected from MDOT’s Qualified Products List.

2.03 THERMOPLASTIC PAVEMENT MARKINGS

A. Hot applied thermoplastic pavement markings in white and yellow colors shall conform to AASHTO M 249, white, yellow and blue thermoplastic striping materials (solid form), and MDOT Section 920.

1. Hot applied thermoplastic paving marking and shall be selected from MDOT’s Qualified Products List.

2.04 COLD PLASTIC PAVEMENT MARKINGS

A. Preformed cold plastic pavement markings in white, yellow and blue colors shall comply with ASTM D4505 and conform to MDOT Section 920.

1. Cold applied plastic pavement markings and shall be selected from MDOT’s Qualified Products List.

2.05 POLYUREA PAVEMENT MARKINGS

A. Two-component, polyurea pavement marking material in white, yellow and blue colors shall conform to MDOT Section 920.

1. Polyurea pavement marking material shall be selected from MDOT’s Qualified Products List.

2.06 TEMPORARY PAVEMENT MARKING TAPE

A. Temporary Pavement Markings shall comply with ASTM D4592, Type R and Type NR and shall conform to MDOT Section 922.06.A.

1. Temporary Pavement Markings shall be selected from MDOT's Qualified Products List.

2.07 GLASS BEADS

A. Glass beads for reflectorizing white, yellow and blue paint markings of pavement by the drop-in method on fresh paint stripes shall comply with AASHTO M 247 and conform to MDOT Section 920.02.

1. Glass beads for use in pavement markings for the type of paint specified shall be selected 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. Costs incurred for removing and disposing of unsuitable materials in preparation of the surfaces to receive the new Work, shall be incidental to the price paid for the pavement markings.

3.03 PERFORMANCE - GENERAL

A. Pavement marking operation shall be limited to the type of Work and the limits as specified on the Plans. If additional area is required by Contractor for storage of equipment or supplies, Contractor shall furnish Engineer with written permission obtained from the property owner of the storage area, permitting the storage.

B. Unless otherwise specified on the Plans or approved by Engineer, Contractor shall conduct his operations and use of his equipment in such a manner that traffic will be maintained throughout the Project.

C. For Work within public rights-of-way and other areas as determined by Engineer, the provisions for maintaining traffic shall be as specified in the Michigan Manual of Uniform Traffic Control Devices (MMUTCD). Costs incurred in maintaining traffic shall be at Contractor's expense.

D. Contractor's equipment shall have sufficient paint capacity to enable sustained pavement marking operations and shall be equipped so as to assure uniform application of the paint and thermoplastic pavement markings.

1. Equipment shall have mechanical bead dispensers or pressurized bead dispensers. In general, the equipment shall be that necessary to accomplish the marking operations in a safe, efficient, and workmanlike manner.

2. For parking lots and other small areas, approved portable equipment and use of hand methods will be allowed.

E. The color of the paint, and the width or type of markings shall be as specified on the Plans or as directed by Engineer.

F. Markings shall be applied so that they adhere adequately to the surface.

G. Markings shall be applied in accordance with the applicable requirements of MDOT Section 811 for permanent pavement markings or MDOT Section 812.03 for temporary pavement markings.

1. Unless otherwise specified, removal of temporary pavement markings shall be incidental to the Project.

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, shall be the responsibility of Contractor and shall be at his expense.

3.05 APPLICATION OF WATERBORNE MARKINGS

A. Waterborne paint shall be applied when the air temperature is 50 degrees F or higher and the pavement is dry.

B. Contractor shall 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. If applied lines are washed away because of rain, Contractor shall be responsible for re-applying the lines at no additional expense to Owner.

C. Waterborne pavement marking materials may be placed immediately on new bituminous pavement.

1. Waterborne pavement marking material shall not be placed before May 1, or after October 1.

D. Waterborne paint shall be applied with an application thickness of 15-mil and 8-mil dry thickness. Glass beads shall be added 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 shall be responsible for insuring that the pavement is free of excess moisture that may effect proper bonding prior to beginning work.

B. Testing for moisture shall be documented and provided to Engineer.

C. Minimum ambient air temperature shall be 48 degrees F and rising at the start of marking operations. If work is started and the air temperature falls below 45 degrees F, and continual

cooling is indicated, all work shall be stopped. The minimum pavement temperature is 50 degrees F.

D. Thermoplastic material shall be heated and applied within the temperature range recommended by the manufacturer.

1. Thermoplastic material shall not be placed before May 14, or after October 1.

3.07 APPLICATION OF POLYUREA PAVEMENT MARKINGS

A. Polyurea pavement markings shall not be applied over existing non-polyurea pavement markings.

B. Existing non-polyurea pavement marking shall be completely removed before applying polyurea pavement markings.

C. Remove curing compounds from concrete pavement.

D. Apply at 15 to 25-mil thickness. Pavement shall be clean and dry. Pavement temperature shall be 40 degrees F higher unless otherwise approved by Engineer.

3.08 TOLERANCES

A. New markings and/or retraced markings shall be placed, with reasonable tolerance, in their proper locations.

B. Incorrect or misplaced markings shall be obliterated and remarked in accordance with 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. Protection of the wet paint and thermoplastic pavement markings shall be the responsibility of Contractor, and all costs incurred to provide the protection will be at his expense.

3.10 WEATHER AND TIME LIMITATIONS

A. Markings shall not be placed when rain is threatening or when the surface to be painted is wet.

B. Pavement marking shall be performed during the period May 1 to November 1, unless otherwise approved in writing by Engineer.

C. No markings shall be applied when the air temperature is less than 50 degrees F, as determined by Engineer.

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. Trees, shrubs and ground cover shall comply with state and federal laws with respect to 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. Contractor shall submit to the Engineer certificates of inspection for plant diseases and insect infestation.

B. Submit a certified analysis of imported topsoil from each off-site source prior to delivery. Deficiencies shall be corrected at 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. All trees shall be inspected and accepted prior to planting. Contractor may 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. Contractor shall request, in writing, at least two (2) weeks prior to any desired inspection date, inspection and approval of the trees at the source. Approved trees will be tagged by the Engineer and the tag shall remain on the tree until planting and final inspection. Contractor shall accompany the Engineer on the inspection.

1. Otherwise, the trees will be delivered to the site. Trees approved for use will be tagged by the Engineer and the tag shall remain on the tree until planting and final inspection. Rejected trees will not be tagged and shall be immediately removed from the site, and new trees shall be brought in for inspection and approval.

C. Plant material shall be subject to approval by the Engineer at the site prior to planting.

1.07 PREPARATION OF SHIPMENTS

A. Plant material shall be clearly labeled as to species and variety. The label or tag shall be securely attached to each plant and shall show the scientific name of the plant. Unless otherwise shown on the Plans, all plants shall be balled and burlapped or container grown.

B. In preparation for spring planting, all balling operations for balled and burlapped stock shall be completed prior to "bud break." In preparation for fall planting of deciduous plants, balling operations shall not commence until after the plants have begun to "harden off."

C. Stock shall be dug and packed with care immediately prior to shipment. Plants shall be dug and transported so as to provide and retain a firm ball of earth.

D. The roots shall be carefully protected with wet straw, moss or other material. The root balls shall be adequately protected from rain or sudden changes in the weather. Balled and burlapped plants will not be accepted if the balls of earth are loosened or broken, or wrapped with material made from synthetics or plastic.

E. Plants furnished in containers shall have their roots well established in the soil mass and shall have grown in the container for at least one (1) growing season. Containers shall be of a size 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. No container grown stock will be accepted if it is root bound.

F. The transporting of all nursery stock shall be in an enclosed or covered vehicle. Deliver plant material immediately prior to planting. Keep plant material 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. Plants shall be rejected when the burlap, stakes, or ropes required in connection with transplanting have been displaced prior to final acceptance.

1.08 STORAGE AND HANDLING

A. Roots of plants shall be kept moist and adequately protected by topsoil or other approved covering until planted.

B. Trunks and branches of trees shall be carefully protected from injury of any kind during operations of digging, loading, transporting and planting. Trees that are injured may be rejected.

1.09 PLANTING SEASON

A. The planting seasons for deciduous plants shall be between March 1 and June 1 and from October 1 until the ground becomes frozen, except that, when unusual planting conditions exist or when container-grown material is used, these 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. The planting season for evergreen plants shall be between March 1 and June 1.

1.10 GUARANTEE AND ACCEPTANCE

A. Contractor shall warrant that all trees have been grown, transported, handled and planted properly so as to be in a vigorous growing condition at the start of the establishment period.

B. Trees, shrubs and ground cover shall be guaranteed for the establishment period(s). Contractor shall replace all trees, shrubs and ground cover showing defective growth, more than 20% dieback, disease, insect infestation or other impairing defects during the Establishment Period with sound, healthy, vigorous growing trees, shrubs and ground cover at no additional expense to the Owner and in accordance with the plans and specifications.

C. At the end of the Establishment Period, the Contractor shall request final acceptance. Final acceptance will be made by the Engineer and Owner provided the trees are healthy and all requirements of the Project have been fulfilled.

1.11 EXPERIENCE AND QUALIFICATIONS

A. Concrete shall conform to MDOT Section 1004, use 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. 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, the Contractor shall 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. All trees and shrubs shall conform to the requirements of AANLS and as specified herein.

B. Plant material shall conform to the sizes given in the plant list or Proposal. All measurements such as spread, ball size, number of canes, quality designations, etc. shall be in accordance with AAN “American Standard for Nursery Stock”.

C. Plant material shall be typical for their species or variety and shall be sound, healthy, vigorous, and free from plant diseases and insect pests or their eggs. They shall have healthy, well developed root systems.

D. Plants designated “B&B” shall be balled and burlapped. They shall be dug with firm, natural balls of earth of sufficient diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant. Balls shall be securely wrapped with burlap and bound with cord. No balled and burlapped plant shall be planted if the ball is cracked or broken. No planting with rot proof burlap or ties shall be permitted. Sand balls are not acceptable.

E. Trees shall be nursery grown stock which has been pruned to encourage single main stems, compact fibrous root systems and symmetrical branching. Trees of the same species shall be uniform in height and spread. All trees shall be free from all insects, diseases, mechanical injuries or other objectionable features. Root balls shall be of the sizes specified in AANLS for the tree root system.

F. Container-grown stock shall have been grown in the containers for one (1) growing season minimum. Plants showing "Pot Bound" root ends will not be accepted.

G. Trees caliper for trees less than 4 inch caliper shall be determined at a point 6 inch above ground when installed. Trees above 4 inch caliper shall be measured at a point 12 inch above the ground.

H. Ornamental trees and shrubs shall be well formed and shall have a crown typical of the species or variety. Low-branched crown types shall be furnished unless the Plans or Proposal specifies a tree form or bush form. Material shall be balled and burlapped, unless otherwise indicated.

I. Plant stock shall have grown to the required size in a normal progressive manner. Heading-back plants to meet sizes called for on the Plans will not be permitted.

J. Evergreen trees will require ball and burlap or other adequate root protection. Tops shall be of a form typical to the species and not unnaturally sheared or color treated. Anti-desiccant protection may be required for evergreen trees.

K. Plant material shall be 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. Mulching material shall be one of the following as specified on the plans.

1. Compost:

a. Compost shall be mature/stabilized, humus-like material derived from the aerobic decomposition of yard waste (i.e., grass clippings and leaves) or other materials as designated compostable as defined in MCLA PA 641 as amended and shall be in compliance with all federal and state laws.

b. Compost shall have a dark brown or black color, be capable of supporting plant growth without ongoing addition of fertilizers or other soil amendments and shall not have objectionable odor. The mixture shall be free of glass, plastic, metal, and other contaminants, as well as viable weed seeds and other plant parts capable of reproducing. The mixture shall be such that no visible water or dust is produced when handling it.

c. The manufacturer of the compost shall provide test data and a statement to show that the following criteria are being met by the compost provided for the project. The composition of the compost shall be 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: Shall 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 shall 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) A data sheet shall accompany the certification. The data sheet shall show 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

2. Wood Chips:

   a. Wood chips shall be the product of a mechanical chipper. Chips shall not include twigs, chopped leaves, or pine needles. Suitability of chip material and size will be determined by visual inspection by the Engineer. Wood chips shall be produced from trees free of any insects and diseases.

3. Shredded Bark:

   a. Shredded bark shall consist of tree bark which has been stripped and shredded from saw logs by means of a debarking machine. Shredded bark shall be produced from trees free of any insect and diseases. The material shall be sufficiently fine and free from extraneous material so that it will readily pass through a conventional mulch blower.

4. Double Shredded Bark:

   a. Double processed shredded bark mulch shall be shredded bark mulch which has been processed twice.

2.03 TOPSOIL

A. Topsoil shall be fertile, friable, sandy clay loam without admixture of subsoil. Topsoil is to be free of glass, stones greater than one in any dimension, weeds, undesirable grasses and other extraneous materials. Topsoil shall have the following range of values:

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. Engineer shall review source and final screen results prior to release of topsoil. Contractor shall submit a certified analysis of the topsoil from each source to the Engineer.

2. Topsoil shall be placed in 4 inch (100 mm) minimum thickness throughout, or as specified in the plans or Specifications.

C. Contractor shall obtain his own topsoil borrow pit source and shall obtain necessary permits and agreements for the use of such borrow pits at his own expense.

2.04 SAND

A. Sand for planting mixture shall be clean, course, ungraded sand conforming to ASTM C33/C33M for fine aggregates.

2.05 FERTILIZER

A. Fertilizer shall be Agriform 21-Gram Planting Tablets Plus Minors or Engineer approved equal. Planting Tablets shall be tightly compressed, long-lasting and slow-release with an N-P-K analysis of 20-10-5. Apply at manufacturer's recommendations and soil analysis.

2.06 PEAT

A. Granulated raw Canadian peat or baled Canadian peat, containing not more than 9% mineral on a dry basis. For ericaceous plants, baled peat with a pH of 4.0 shall be used.

2.07 LANDSCAPE WEED CONTROL FABRIC

A. Weed barrier fabric shall consist of a geotextile fabric, spun-bonded polypropylene, non-woven fabric and a UV stabilizer.

B. Fabric shall have 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. Steel landscape edging shall be double staked at overlap joints, and designed to receive tapered steel stakes.

B. Steel Edge shall be 12ga steel, 4 inches wide, by 10 foot length, with 4 stakes. Painted finish shall be Sherwin Williams H68GT85 powder coat paint electrostatically applied and oven baked. Minimum thickness to be 1.5 mils. Color shall be green, brown, or black as determined by the Owner.

C. Steel stakes shall be Steel, tapered, 14 inch length and finished to match specified steel landscape edging. Stakes shall be designed specifically to anchor steel landscape edging in place, and made by the manufacturer of the steel landscape edging for which they will be used.

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. Stakes used for bracing or guying plants shall be sound wood of nominal 2 x 2 inch stock and shall be approximately 30 inches in length for guying or of the required length for bracing. The stakes shall be pointed on one end by beveling on two (2) sides.

B. Metal stakes for bracing trees shall be green metal T-section posts with no anchor plates. Posts shall be at least 8 foot long. Posts shall only be used where specified on the plans.

2.10 WIRE FOR GUYING AND BRACING

A. Wire shall be new and free from bends or kinks.

B. Wire used for guying trees 4 inches or less in diameter shall be No. 11 steel wire.

C. Wire used for guying trees over 4 inches in diameter shall be No. 9 galvanized steel wire.

2.11 HOSE

A. Hose used with wire for guying trees shall be new 1/2 inch reinforced rubber garden hose or steam hose.

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. Balling material shall be untreated burlap or other material which will readily decompose. Synthetic materials such as nylon or plastic will not be permitted.

2.14 PLANTING MIXTURE

A. Planting mixture shall be a mixture of 1/3 topsoil, 1/3 sand, and 1/3 peat. Add fertilizer at the quantity as recommended by the manufacturer. Planting mixture shall be free from stick, stones, sod, clods or other material which might leave pockets around the roots.

2.15 BIORETENTION PLANTING MIXTURE

A. Bioretention planting mixture shall have a sandy loam, loamy sand, or loam texture per USDA textural triangle. Maximum clay content shall be 5%.

B. The soil mixture shall have a pH between 5.5 and 6.5 and an organic content of 1.5 – 3.0%.

C. The soil mixture shall have an infiltration rate greater than 0.5 inches/hr.

D. The soil shall be a uniform mix, free of stones, glass, trumps, roots, or other similar objects larger than 1 inch.

E. No other material or substances shall be mixed or dumped with the bioretention mix that may be harmful to plant growth, or prove a hindrance to the planting or maintenance operations.

F. The planting mixture shall be free of Bermuda Grass, Quack grass, Johnson Grass, Mugwort, Nutsedge, Poison Ivy, Canadian Thistle, Tearhub, or other noxious weeds.

2.16 ACCEPTABLE MANUFACTURERS

A. Plastic guying and bracing material shall be 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. Contractor shall stake all plant locations and confirm the locations and type of plants to be placed 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. Contractor shall not begin excavation until stake out of tree and/or shrub locations are acceptable to the Engineer.

B. Contractor shall stake enough planting locations for two weeks work. Contractor shall arrange periodic site meetings with the Engineer for the purpose of reviewing the work that has taken place in the prior two weeks and the staking for the next two weeks. Contractor shall notify the Engineer at least three (3) working days prior to the desired date for inspection of staking.

C. Contractor shall accurately stake plant material location according to the plans. Stakes for trees shall be 36” high above finished grade and painted a bright color to be clearly visible for inspection. Distinguish by color between types of material, i.e., evergreen trees, canopy trees, flowering trees. Staking for shrubs, perennials, and ground covers shall be staked 18 inches high above finished grade and painted white. Stakes shall be placed at the perimeter and at the bed line 30 feet on center. Engineer shall review the locations and make changes in locations as necessary.

3.03 PLANTING

A. Balled and burlapped plants shall be set plumb. Tree pits shall be excavated as shown on the plans. Contractor shall dispose of subsoil dug from pits, trenches and beds.

B. Contractor is responsible for planting to correct grades and alignment and all plants shall be set so that, when settled, they will bear the same relation to finish grade as they did before being transplanted. No filling will be permitted around trunks or stems.

C. At the start of the Work tree pits and beds are to be excavated and the Contractor shall request inspection and approval by Engineer. Approval must be received before backfilling occurs.

D. The root ball shall be set on a compacted base as detailed. Burlap shall be cut away from top 1/3 of the root ball and all ropes, wires, etc. securing the ball shall be removed.

E. Plastic tape and/or plastic fabric shall be completely removed from the root ball during the planting operation. "Rot proof" or treated burlap shall also be totally removed.

F. Container-grown plants shall be planted as specified for balled and burlapped stock, except that when plants are furnished in non-plantable containers, the container shall be removed only at the time of planting. Plants furnished in plantable type containers shall have container sides severed in multiple places and the upper half of the container removed during the planting operation. Care shall be taken to protect tree roots during severing and removal operation.

G. When the plant has been properly set, the pit shall be backfilled with planting mixture, gradually filling, tamping and settling with water. No soil in a frozen or muddy condition shall be used for backfilling. The backfill shall be placed to an elevation flush with the ground elevation and the rootball, except that a saucer shall be created near the edge of the hole to capture water.

H. During fall planting, an Engineer approved superphosphate fertilizer shall be applied over the planting mixture at a rate per the manufacturer's instructions.

I. All evergreen plant material shall be sprayed with an Engineer approved anti-desiccant according to manufacturer's instructions and limitations immediately following planting and during final seasonal watering.

3.04 MULCHING

A. After backfilling is completed, mulching material shall be placed over the plant hole area to a depth of 5 - 6 inches or as specified on the plans. Thoroughly soak all mulched areas. After watering, all mulched areas shall be raked and left in a complete and finished manner.

B. Perennial areas shall have 3 inches of mulch or as specified on the plans. Mulch these areas first and then plant ground cover through the mulch.

C. Planting beds shall be mulched with a 4 inches cover of mulch as shown on the drawings and details, unless otherwise indicated on the drawings. Mulch depths shall be 4 inches at time of inspection.

D. For plants located on slopes, an earth saucer or berm shall be constructed halfway around each plant on the down slope side. The saucer or berm shall have an inside diameter equal to that of the planting hole, and a maximum height of 6 inches. A trench shall be dug on the down slope side and filled 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. Trees required to be braced, shall be braced or guyed immediately after planting.

2. All plants required to be braced shall be braced with a minimum of two (2) stakes. Stakes shall be driven to avoid ball and shall be no closer than 1 foot -foot (300 mm) from the trunk.

3. Stakes shall be driven to a depth which will firmly anchor the plant, but in no case less than 1 foot below the bottom of the planting hole. The wide side of the stake shall face the trunk of the plant.

4. Stakes shall extend to within 4 inches of the lowest plant's main branches. Top of stake shall be firmly attached to the trunk with steel wire or plastic guying and bracing material.

5. When using steel wire, place wire so it forms a figure eight (8) around the stake and trunk. Portions of wire around trunk shall be encased in water hose of sufficient length to contain the wire loop around the trunk. Enclosed trunk loops shall not restrict normal trunk growth.

6. Stakes shall be positioned on opposite sides of trunks and secured to the trunk at approximately 2/3 the height of plant. Warning tape or ribbon shall be tied to the wiring between the tree and the stake.

3.06 PRUNING

A. Where determined by the Engineer, pruning will be required. All pruning of the new plants shall be done by workmen experienced in this type of Work. Pruning shall be completed prior to planting. Hedge shears shall not be permitted for pruning. Pruning shall be done in accordance with the best standard practices.

B. Deciduous trees shall have branches pruned to balance the loss of roots in such a manner as to retain the natural form of the tree type.

C. Evergreen trees shall be pruned only to the extent of removing broken or damaged branches.

D. Cuts shall be made 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. All plants shall be thoroughly soaked after planting. After all watering, all beds shall be raked and left in a complete and finished manner.

B. Watering, Fertilizing and Cultivating is required during the Establishment Period. Watering, Fertilizing and Cultivating shall include all measures necessary to establish and maintain plants in a vigorous and healthy growing condition for the entire Establishment Period.

C. Contractor shall manually water the plants a minimum of once a week or as necessary to keep the plant in a thriving condition 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. If the Contractor concludes that at any time the irrigation system is not working properly, then they shall notify the Engineer or the Owner so that it may be fixed in a timely manner.

2. However, the Contractor will have to manually water the plants as necessary to keep them in a thriving condition at all times that the irrigation system is not working properly.

E. Keep planting beds and tree saucers free from weeds to the satisfaction of the Owner. Treat mulch with pre-emergent weed killer.

F. Keep trees erect. Raise trees that settle below grade to the established elevation. Keep tree wrap and wire in neat condition. Prune dead or broken branches from all trees and shrubs. Fill to the original grade level areas that have settled around trees and shrubs.

G. Winter protection shall include late fall spraying of all evergreen trees and evergreen shrubs with anti-desiccant, emulsion type agent, at the manufacturer's recommended rate to prevent winter desiccation and late fall watering if required by a dry season.

H. At the seasons first watering, an Engineer approved organic timed release, balanced fertilizer shall be applied to the ground around the tree at the rate instructed by the manufacturer. In lieu of organic fertilizer, pre-packaged, controlled release fertilizer packets may be used. Use one (1) 2 oz packet of fertilizer per every 1 inch caliper of tree, or one (1) 2 oz packet for every shrub.

I. During the first and second watering of the growing seasons, the water used for each plant shall be a nitrogen-enriched solution containing available nitrogen at the 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). No fertilizer shall be applied after July 7.

J. During the establishment period(s) as called for in the Contract Documents, the Contractor shall do all required watering, cultivating, pruning, fertilizing, weeding, and all other work necessary to keep the planted material vigorously growing sound and healthy. Contractor shall repair or replace any guying or bracing which is damaged, destroyed, or broken. Contractor shall spray any plant material which becomes diseased or infested with insects.

K. Contractor shall repair or replace any trees which are blown over, knocked down, uprooted or otherwise become impaired or defective.

L. Contractor shall replace any plant material which is not in good physical condition, has more than 20% die back, shows defective growth, disease, signs of insect infestation, or any other signs of impairing defects during the Establishment Periods.

M. Contractor shall 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. The costs for all labor, material, and equipment necessary to carry out the provisions of this Article shall be included in the Contractor's bid price for the planting of trees unless otherwise indicated in the Proposal. Contractor shall notify the Engineer prior to beginning any work called for under this Article.

O. At the end of the Establishment Period, unless otherwise determined by the Engineer, the guying material, wrapping material, identification tags, and inspection tags shall be removed and disposed of off the project and the mulch around all the plants shall be replenished to the required depth of 5 - 6 inches.

3.08 ESTABLISHMENT PERIOD

A. The Establishment Period shall begin on the day of written acceptance of the installation of the trees, shrubs, bulbs, ground cover or other plant material. Each subsequent establishment

period shall begin on the same day of the succeeding year(s). The Establishment Period shall be a minimum of one year unless otherwise indicated in the Contract Documents.

3.09 SCHEDULES

A. The general planting location, type and size of tree or shrub shall be as indicated on the Plans. Any substitutions of plant material or alteration in plant sizes or specifications shall be approved by the Engineer prior to ordering.

3.10 STEEL LANDSCAPE EDGING

A. Install steel landscape edging where indicated on Drawings, according to manufacturer's recommendations. Anchor with steel stakes spaced approximately 30 inches on-center, driven below top elevation of edging, or at every stake pocket location in landscape edging sections designed and manufactured to receive stakes. Stakes shall be located 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. Engineer shall be given 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. Chemical fertilizer shall be supplied in suitable bags with the net weight of the contents and guaranteed analysis shown on the container. Bulk shipments shall be accompanied by an analysis and net weight certification of the shipment.

1. Custom mixed fertilizers shall be accompanied by 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) included.

1.04 SOURCE QUALITY CONTROL

A. A seed mixture proposed for use in the Work shall have been tested 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. Contractor shall perform soil tests -1 per designated area - to confirm the fertilizer and lime necessary for the site. Contractor to limit the amount of fertilizer and lime to what is absolutely necessary to ensure optimal growth.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Materials shall be delivered to the Project site in their original, unopened containers. Containers shall be clearly marked showing, name of manufacturer, brand name, trade name or generic name of material, warranty of analysis, net weight of contents and date of packaging, where applicable.

B. Seed shall be delivered to the site in durable bags, tagged or labeled to show date of tests, warranty of purity and germination analysis, name, lot number and net weight of contents.

C. Commercial fertilizers shall be delivered to the site of the Work in the original unopened bags. Bags shall not exceed 100 lbs net weight each and shall be clearly marked with guaranteed analysis in a conspicuous location on each bag.

D. Material shall be stored at the Project site, under shelter, off the ground and shall be protected from damage by moisture, temperature, exposure to elements, vandalism or other action which might otherwise impair their use.

E. Materials proposed for use in the Work shall be handled in a manner that will protect the material and the personnel involved in the Work. Handle seed in a manner which will 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. Contractor shall establish a dense cover of seeded grass on all disturbed areas. These areas shall be maintained until final acceptance of the Work by the Engineer. Engineer will inspect the turf to insure that the grass seed is well established, weed free, in a growing and vigorous condition. Areas that do not meet the approval of the Engineer shall be re-seeded at the Contractor's expense.

PART 2 PRODUCTS

2.01 SEED

A. Seed and seeding mixtures shall be certified, mature, clean, dry, new crop seed products suitable for the specified applications and having the percentages of purity, germination and proportions, by weight, 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. The specific mixture to be used shall be for the type of soil on the Project and the location of the seeding per Table 2, unless otherwise indicated on the Plans or as 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. Hydroseeding shall consist of 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. Wood excelsior shall be made of green timber fiber baled so that the bales weigh 80 to 90 pounds at the time of manufacture.
3. Wood excelsior blankets shall be made of a uniform web of interlocking fibers with a backing of fabric netting on one (1) side only. The fabric net shall have a mesh size not exceeding 1-1/2 x 3 inch and shall be a woven of either cotton cord, twisted paper cord or a synthetic, biodegradable fiber.
4. Blankets shall be produced in the form of a tightly compressed roll 36 ±1 inch wide and approximately 120 feet long. Blanket shall have a fiber net on the outside of the fiber mat.
5. Blanket roll weight, when manufactured, shall average 85 lbs ± 10%.
6. Each roll shall have separator sheets of 40 pound Kraft paper placed at the beginning and at the end of each roll to facilitate unrolling and handling at the job site. The Kraft paper sheet at the end of each roll shall also form 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. The net shall consist of a biodegradable mesh with openings not to exceed 1-1/2 x 3 inch.
3. The net shall be furnished 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. Fertilizer shall be a standard commercial grade fertilizer, conforming to state regulations, of the type recommended for grasses. The fertilizer shall contain slow release nitrogen amounting to 75% of the nitrogen available.

B. Fertilizer shall be uniform in composition, free flowing and suitable for application with method selected.

C. Fertilizer for hydraulic seeding shall be soluble or ground to a fineness that will permit complete suspension of all insoluble particles in the slurry.

2.05 AGRICULTURAL LIMING MATERIALS

A. Burnt lime (quick lime), hydrated lime, limestone (calcite and dolomite), marble shells and by-products shall conform to the requirements of ASTM C602.

2.06 WATER

A. Free of matter harmful to plant growth.

2.07 STAPLES

A. Wire staples for holding mulching materials in place shall be not less than 6 inches long No. 11 (U.S. Steel Gage) steel wire or longer.

2.08 TOPSOIL

A. Topsoil shall be fertile, friable, sandy clay loam without admixture of subsoil. Topsoil is to be free of glass, stones greater than 1 inch in any dimension, weeds, undesirable grasses and other extraneous materials. Topsoil shall have 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. Engineer shall review source and final screen results prior to release of topsoil.

D. Contractor shall submit a certified analysis of the topsoil from each source to the Engineer.

E. Topsoil shall be placed in 3 inch minimum thickness throughout, or as specified in the Plans or Specifications.

F. Contractor shall obtain his own topsoil borrow pit source and shall obtain all necessary permits and agreements for the use of such borrow pits at Contractor's expense.

2.09 IMPROVED TOPSOIL

A. Improved topsoil shall consist of a mixture of 2/3 topsoil and 1/3 compost. The improved topsoil mixture shall have a dark brown or black color, be capable of supporting plant growth without ongoing addition of fertilizers or other soil amendments and shall not have objectionable odor.

2.10 COMPOST

A. Compost shall be mature/stabilized, humus-like material derived from the aerobic decomposition of yard waste (i.e., grass clippings and leaves) or other materials as designated compostable and shall be in compliance with all federal and state laws. The mixture shall be free of objectionable odors, glass, plastic, metal, and other contaminants; as well as viable weed seeds and other plant parts capable of reproducing. The mixture shall be such that no visible water or dust is produced when handling it.

B. The manufacturer of the compost shall maintain annually on file with the Michigan Department of Agriculture, Pesticide and Plant Pest Management Division, test data and a statement to show that the following criteria are being met by the compost provided for the project.

C. The composition of the compost shall be 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: Shall 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 shall 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. A data sheet shall accompany the certification.
    a. The data sheet shall show 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. The surface of the subgrade immediately prior to being covered with topsoil shall be raked or otherwise loosened to a minimum depth of 2 inch to facilitate making a bond between the subsoil and the topsoil.

3.02 PREPARATION OF SOIL

A. After the areas to be seeded have been brought to the required grade and properly trimmed and cleaned up, the existing soil shall be brought to a friable condition by harrowing or otherwise loosening and mixing to a depth of at least 4 inches.

B. Lumps and clods shall be thoroughly broken. When 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 will not be required.

3.03 PREPARATION OF MULCH MATERIAL

A. When seed is to be sown through mulch which has been in place for a period of more than two (2) weeks or which is being held in place by a surface-applied coating of asphalt emulsion or other adhesive, the mulched area shall be prepared for seeding by discing, a spike-toothed harrow, or by other means acceptable to the Engineer.

3.04 PLACING AND SPREADING TOPSOIL

A. Topsoil shall be placed and spread over the area designated on the Plans, or as determined by the Engineer, to a depth of 4 inches or to such depth as specified on the plans.

B. Topsoil shall be placed to a depth sufficiently greater than that shown on the Plans or specified so that, after natural settlement or rolling, the completed Work will conform to the lines, grades and elevations shown on the Plans.

C. Spreading of topsoil shall be completed in such a manner that seeding as specified can proceed without additional moving of topsoil. Topsoil furnished and placed shall be considered incidental to seeding unless otherwise specified in the Proposal.

D. After topsoil is spread, large earth lumps, rocks, roots, debris, or other foreign matter shall be raked and removed from the topsoiled area and legally disposed of by the Contractor.

3.05 FERTILIZING

A. Chemical fertilizer shall be applied on the prepared soil surfaces at a minimum rate of 660 lbs per acre of 12-12-12 fertilizer, or such other rate of another fertilizer mixture that yield 240 lbs per acre of chemical nutrient.

B. Dry fertilizers shall be thoroughly disced, harrowed or raked into the soil to a minimum depth of not less than 1 inch.

C. Where hydraulic seeders are used for sowing seed, one half the recommended rate of fertilizer may be spread in combination with such sowing with the balance incorporated into the soil prior to seeding. In all other cases, fertilizer shall be incorporated into the soil before any seeding is started.

3.06 SEEDING

A. Seed of the kind required shall be sown at the rate as specified in Table 2. Seed shall be sown in the presence of an inspector by mechanical spreader, hydraulic seeder or broadcasting. The broadcasting method shall be used for sowing seed only in areas inaccessible to mechanical spreading equipment. Seeding during winds above 15 mph shall not be permitted.

B. Prior to placing seed materials, water topsoil to a depth of 4 inches at least 48 hours prior to seeding operations to obtain a loose friable seed bed. Time and depth of watering operations shall be varied at the direction of the Engineer for varying conditions at the site of the Work.

C. Broadcasting methods for sowing seed materials shall be accomplished by spreading one-half of the specified amount of seed in one direction and then broadcasting the remaining one-half of the seed at right angles to the first seeding pattern using the same broadcast method.

D. Rate of broadcast shall be as 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. Hydroseeding shall be performed using suitably acceptable hydraulic seeding equipment and a homogeneous slurry solution of water, seed, fertilizer and suitable mulch material as approved by the Engineer. Seed slurry mixture shall be distributed uniformly at a rate approved by the

Engineer for the seeding materials and/or mulch materials used to suit the seed application rate. Seed application rate shall be 300 lbs per acre.

3.07 MULCHING

A. Mulching shall consist of placing a mulch material on areas that have been or are to be seeded. Mulch shall be placed in a loose enough condition so as to allow penetration of sunlight and circulation of air, but thick enough to shade the ground, reduce the rate of water evaporation and prevent erosion by wind or water. Mulch shall be secured 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. Commercially manufactured netting and/or fiberglass materials shall be anchored in accordance with 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. Fiberglass mulch shall be removed before seeding because of its permanence. Care shall be taken to prevent fiberglass filaments left in place from becoming entwined or wound around shafts of power mowers or other power equipment.

E. Acceptable proprietary netting and erosion control materials shall be disposed of in accordance with the manufacturer's printed instructions for the material used prior to any seeding operations.

3.09 TURF ESTABLISHMENT

A. Seeded areas shall be watered whenever excessive drying is evident during the period set for establishment. Watering shall be done in a manner that will prevent erosion due to the application of excessive quantities and the watering equipment shall be of a type that will prevent damage to the cultivated surfaces.

B. Contractor shall be responsible for the proper care of the seeded areas until final acceptance of the entire Work covered by the Contract.

C. The seeded areas shall be mowed with mowing equipment acceptable to the Engineer to a height of 2 inches whenever the average height of grass establishment reaches four 4 inches. When the amount of cut grass is heavy, cut grass shall be removed to prevent destruction of the underlying grass.

D. If weeds or other undesirable vegetation threaten to smother the planted species, such vegetation shall be mowed, or in the case of rank growths, shall be uprooted, raked and legally disposed of from the area.

E. Reseed and mulch areas larger than 4 sq inches not having a dense, uniform, vigorous stand of grass acceptable to the Engineer.

F. The establishment period shall extend for a period from the time of seeding until the seeded area has a uniform stand of grass acceptable to the Engineer. The minimum period shall be 30 days.

G. If after 60 days from the initial seeding a dense, uniform, vigorous stand of grass has not been established by the Contractor, the Owner may reseed the defective areas and all costs will be deducted from the Contractor’s payments.

END OF SECTION

SECTION 33 01 30.11 - TELEVISION INSPECTION OF SEWERS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section provides for the color closed-circuit television (CCTV) inspection and electronic recording of existing sewers for the purpose of locating and observing the condition and possible extraneous connections.

1. The Work is to be performed by current NASSCO PACP certified operators, with current PACP coding, and delivered entirely in electronic format.

2. Contractor shall note that CCTV software compatibility with Owner's software and databases is required, and a Pre-Inspection deliverable is required to be submitted and approved before beginning Work. See "Software Compatibility" below.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 50 00 - Temporary Facilities and Controls

C. Section 01 89 00 - Site Construction Performance Requirements

D. Section 33 01 30.30 - Sanitary Sewerage Flow Control

E. Section 33 01 30.41 - Cleaning of Sanitary Sewerage Utilities

1.03 QUALITY ASSURANCE

A. Unless otherwise specified, the work for this Section shall conform to the applicable portions of the following standard specifications.

1. NASSCO - National Association of Sewer Service Companies

2. PACP - Pipeline Assessment Certification Program

B. Qualifications

1. All CCTV operators shall be NASSCO-PACP certified.

2. Database shall be the latest version of NASSCO-PACP Certified Access Database unless otherwise approved by the Engineer.

3. CCTV software shall be current NASSCO-PACP Certified.

4. CCTV inspections (Video and Data Collected) will be delivered entirely in digital format.

1.04 SOFTWARE COMPATIBILITY

A. Upon award of Contract, the Contractor shall CCTV inspect at least three (3) segments or 1,000 feet of pipe and submit the data to the Owner to verify that the CCTV database is compatible with the Owner's PACP Data Management software, GIS integrations software; and that the deliverables are acceptable to the Owner.

B. The Owner shall verify acceptability of the deliverables within five (5) business days of receipt. The Contractor shall not begin Work on the Project until this software compatibility has been approved.

1.05 SCHEDULE OF WORK

A. Contractor shall submit to the Owner prior to beginning television inspection a schedule for sequence of sewer lines designated to be televised.

1.06 FINAL SUBMITTALS

A. Electronic Inspection:

1. Work shall conform to the latest version of NASSCO, Pipeline Assessment and Certification Program (PACP) standards. The documentation of the work shall consist of NASSCO PACP CCTV Reports, NASSCO PACP database, logs, electronic reports, etc. noting defects and observations encountered during the inspection.

2. The importance of accurate distance measurements is emphasized to enable location of the defects for rehabilitation work.

3. Electronic Television Inspection shall also include:

   a. Protruding services with extent of protrusion

   b. Location of broken and/or collapsed pipes with beginning and ending distance, extent of damage, etc.

   c. Percent of Ovality in deformed pipes

   d. Percent of restriction for sewers with root intrusion, mineral deposits, etc.

4. CCTV inspections shall include complete and accurate PACP mandatory header information and report coding for all sections of sewer. In addition to the required header information, the following additional information is required for this Project:

   a. Time

   b. Pipe section reference

   c. Pipe lining

   d. Total Length

   e. Length surveyed

5. Data shall be submitted on a single drive, as approved by the Owner, and shall be properly identified as to Project, location, time, and date in a manner acceptable to the Owner.

B. Electronic Video Inspection Recordings:

1. The purpose of video inspection recordings shall be to supply an electronic visual and audio record of problem areas of the lines that may be replayed. The CCTV inspection shall be entirely recorded in a PACP approved electronic format submitted with electronic links between the data and the video.

C. Database Software:

1. Provide database in a read-only format using PACP approved software. Also provide the read only version of software used for collection and encoding data, and for report preparation. Videos and photos must also be in a readable format with standard PACP approved inspection management software.

D. GIS Integration:

1. Submit shape files of television and inspection records. Shape files shall include points along the mainline sewer indicating the location of factory taps, roots, failed joints, or any other feature where PACP code is recorded as a part of the sewer and manhole inspection.

2. The shape files shall include the following information: manhole number, observation date, observation time, PACP Code, PACP score, remarks or notes, name and certification number of the inspector, report sheet number, video number, and Client name/location.

3. In addition, pipe reports, screen shots or photos of the observation (factory taps, joints, plugs etc.), and videos shall be hyperlinked to the features in the shape files.

1.07 JOB CONDITIONS

A. Sewer Flow Control:

1. When sewer line depth of flow at the upstream manhole of the sewer section being worked is above the maximum allowable for television inspection, the flow shall be reduced to the level shown below by operation of pump stations, plugging or blocking of the flow, or by pumping and bypassing of the flow as specified. Sewer flow control shall be in accordance with Section 33 01 30.30 - Sanitary Sewerage Flow Control.

2. Depth of flow shall not exceed that shown below for the respective pipe sizes as measured in the manhole when performing television inspection.

a. Maximum Depth of Flow for Television Inspection of sewer

1) 20% of pipe diameter

2) 25% of pipe diameter

3) 30% of pipe diameter

b. Plugging or Blocking

c. A sewer line plug shall be inserted into the line upstream of the section being worked. The plug shall be so designed that all or any portion of the sewage can be released. During CCTV inspection flow shall be reduced to within the limits specified above. After the work has been completed, flow shall be restored to normal.

d. Pumping and Bypassing

e. When pumping and bypassing is required the Contractor shall supply the pumps, conduits, and other equipment to divert the flow of sewage around the manhole section in which work is to be performed.

f. The bypass system shall be of sufficient capacity to handle existing flow plus additional flow that may occur during a rainstorm.

g. The Contractor will be responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypassing system.

h. If pumping is required on a 24-hour basis, engines shall be equipped in a manner to keep noise to a minimum.

B. Flood Prevention:

1. When flow in a sewer line is plugged, blocked, bypassed, or in any other way restricted, sufficient precautions must be taken to protect the sewer lines from damage that might result from sewer surcharging. Further, precautions must be taken to ensure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved.

1.08 VERIFICATION

A. Verify that arrangements for pedestrian and equipment access to structures within rear yard easements have been made. Consideration shall be given to the rights of adjacent property owners.

PART 2 PRODUCTS

2.01 TELEVISION CAMERA AND EQUIPMENT

A. Television camera used for the inspection shall be one specifically designed and constructed for such inspection. Camera shall be color, pan, tilt and zoom; or a sidewall scanning (panoramic) camera specifically designed and constructed for sewer inspection.

B. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions.

C. Camera, monitor, and other components of the video system shall be capable of producing picture quality to the satisfaction of the Engineer; and if unsatisfactory, equipment shall be removed and no payment will be made for an unsatisfactory inspection.

D. The importance of accurate distance measurements is emphasized. Measurement for location of defects shall be above ground by means of a meter device. Marking on the cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Accuracy of the distance meter shall be checked by use of a walking meter, roll-a-tape, or other suitable device, and the accuracy shall be within ± 2 feet.

PART 3 EXECUTION

3.01 PREPARATION

A. Locating the Work:

1. Contractor shall locate all structures and note sewer diameter and direction of flow. Notify the Owner of detrimental access, structure, and/or sewer conditions which may adversely affect the progress of the Work.

2. Manholes found that are not shown on the maps issued for the Project shall be identified as to exact location, distance and direction of adjoining manholes, sizes of connecting sewers, and shall be submitted in writing to the Engineer. Any manholes not found or found

in a location different than as shown on the maps, shall also be similarly identified and located.

3. Location data for found of misidentified manholes shall include:

4. State plane coordinates to horizontal accuracy of ±3 feet or less

5. Addresses as applicable with location at address (ie.: back yard, front yard in right-of-way, etc.).

B. Cleaning Sewers:

1. Prior to the Contractor televising the existing sewers, it shall be the responsibility of the Contractor to clean each sewer line in accordance with Section 33 01 30.41 - Cleaning of Sanitary Sewerage Utilities.

3.02 PERFORMANCE

A. After cleaning, the sewer sections shall be inspected by means of closed-circuit television. The inspection will be done one sewer section at a time and the flow in the section being inspected will be suitably controlled as specified.

B. The camera shall be moved through the line in the direction of the flow (downstream) except when not physically possible or when doing a reverse inspection.

C. The maximum rate of travel shall be 30 feet per minute unless otherwise approved by the Engineer. In all instances, the speed of travel shall be slow enough to inspect each pipe joint, tee connection, structural deterioration, inflow and infiltration (I&I) source and deposits.

D. The camera shall pause, pan, and visually inspect all service connections, maintenance defects, structural defects, miscellaneous abnormal sewer conditions, and anywhere when necessary to permit proper documentation of the sewer's condition. If utilizing a side wall scanning camera, pausing, and panning of each lateral is not necessary if the image clearly depicts the inside of the lateral for post processing.

E. If during the inspection operation, the television camera will not pass through the entire section of sewer from manhole to manhole, the Contractor shall set up his equipment so that the inspection can be performed from the opposite manhole (Reverse Inspection).

1. If during the reverse inspection the television camera will not pass through the entire section of sewer, the inspection shall be considered complete.

2. If however, root cutting, deposit cutting, or cutting intruding services is required to complete the inspection, this Work (upon approved by the Engineer prior to beginning the Work) shall be completed before the television inspection shall be considered complete.

F. The camera shall be positioned in the line in such a manner so as it is always as near to the center of the line as possible.

G. The image quality shall be adequate for post-inspection coding. The Contractor shall be required to repeat the inspection at the Contractor’s expense if the image quality is unsuitable for any reason.

H. If observed defects are such that further operations may compromise the structural integrity or cause damage to the pipe, the Contractor shall notify the Engineer in writing of the observed condition and reason(s) continued CCTV inspection would be harmful.

I. Recording shall be done during times of good visibility. No recording shall be done during periods of visible fog or steam in the sewer, or when the camera lens is dirty, coated, or under water (as outlined below) unless otherwise authorized by the Owner.

J. Television inspection reports shall be with-in +/- two (2) feet of the measured linear footage between manholes along the existing sewer centerline from the start of pipe to end of pipe.

K. Owner and PACP required header information must be fully and accurately entered on all CCTV reports. Work not following these specifications may be rejected for payment and the Contractor may be required to re do the work.

L. Contractor shall provide a PACP certified operator on site at all times during the entire CCTV inspection. If video is to be coded separately from the actual recording, both the onsite Operator and the individual performing the PACP coding shall be PACP certified.

M. Any portion of the video inspection recording that is of insufficient quality as determined by the Engineer shall be redone by the Contractor at no additional cost to the Owner.

3.03 MAINTAINING TRAFFIC, RESTORATION, AND PROTECTION OF EXISTING IMPROVEMENTS

A. Contractor shall be responsible for maintaining traffic at all times in accordance with Section 01 50 00 - Temporary Facilities and Controls.

1. The Contractor shall 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". Furnish all flagmen and watchmen as are necessary to maintain and safeguard traffic during the Work. Furnishing, installing, and maintaining traffic control devices shall be incidental to the Project.

B. Damage to any existing improvements including fences, utilities, landscaping, lighting, lawns, trees, structures or any other items, shall be restored to their original condition in accordance with Section 01 89 00 - Site Construction Performance Requirements.

3.04 USE OF PREMISES

A. Contractor shall not trespass upon or in any way disturb private property without first obtaining written permission from the property owner as appropriate to do so. A copy of such written permission shall be furnished to the Owner prior to accessing the site.

B. It shall be the Contractor's responsibility to work equipment around poles, trees, or other obstructions and to do so at his own expense.

C. If the Contractor finds it necessary to obtain additional working area, it shall be the Contractor's responsibility for its acquisition.

D. Contractor shall, at no additional expense, restore such property to the original condition in the sole and unfettered opinion of the Owner. Contractor must take photographs and/or videos of existing properties prior to the disturbance of any property, and make a copy available to the Owner.

E. Items within the street right-of-way or sewer easement shall be removed, removed and replaced, or restored as directed by the Owner.

F. Contractor shall ensure all employees have a badge or visible identification during any time that they on the project site or within private property. This identification must be worn so that it is readily recognized and readable to the public.

END OF SECTION

SECTION 33 01 30.41 - CLEANING OF SANITARY SEWERAGE UTILITIES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Contractor shall provide materials, labor, equipment, and services necessary for sewer line cleaning, manhole cleaning, and internal obstruction removal.

1. Cleaning shall remove sediment, rocks, debris, roots, grease accumulations and obstructions from length of sewer and manholes to be lined, as well as hydraulic root cutting and/or grinding/cutting protruding break-in service connections.

2. Cleaning of sewer and manhole walls in vicinity of lining shall remove grease, scale, encrustation and loose mortar so that no foreign intrusion shall cause imperfections in lining (e.g., bumps, folds, dimples).

3. Sewer cleaning methods shall be washing with high pressure water or other as approved by Engineer.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 33 01 30.11 - Television Inspection of Sewers

B. Section 33 01 30.82 - Liners for Wastewater Structures

C. Section 33 01 30.30 - Sanitary Sewerage Flow Control

1.03 SUBMITTALS

A. Methods:

1. Contractor shall submit a letter that identifies methods that will be used to remove sediment, debris, grease, scale, encrustations, loose concrete, roots and break-in connections throughout section of sewer to be cleaned. Include the following:

a. Detailed explanation of cleaning process.

b. Schedule of activities.

c. References where identified cleaning method(s) has been used successfully in the past by the Contractor.

d. List of the actions to mitigate impact to Owner during cleaning operation.

B. Schedule:

1. Contractor shall submit a schedule that outlines the sequence in which Contractor proposes to conduct his operations and shall be approved by Owner before work is started. Original and updated schedules must be provided to Owner electronically.

2. The schedule shall:

a. use a time-scaled logic diagram format;

b. provide a level of detail of activities that are clear and concisely communicate of the plan of work; and

c. at a minimum show initial mobilization, start-up, cleaning and televising, and any resultant point repairs shall be included.

3. The software used for producing the schedules must have the capability to tailor the form and format of schedules, and accompanying reports, to the Owner's requirements.

4. Owner may require additional updates to the schedule as changes occur. These additional updates will be submitted to Engineer within 24 hours of the request.

5. Changes to the schedule are subject to approval of the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Do not use chemicals without written approval of the Professional. Do not use chemical which may be considered hazardous or detrimental to organisms or equipment of wastewater treatment plant.

2.02 EQUIPMENT

A. High-Velocity Hydraulic (Hydro-Cleaning) Equipment: Equipment shall be capable of removing dirt, grease rocks, sand, roots, and other materials and obstructions from sewer lines and manholes.

B. Equipment shall have selection of two or more high-velocity nozzles. Nozzles shall be capable of producing scouring action from 15 to 45 degrees in all size lines designated to be cleaned, with nozzle capable of producing flows from fine spray to solid stream.

C. Equipment shall carry its own water tank, auxiliary engines, and high-pressure water pump.

D. Combination Unit Pump: Capable of pumping at least 80 gallons per minute (300 liters per minute) at 2,000 psi (13.8 MPa), measured at beginning of hose reel.

E. Water Pump: Able to run at 2,000 psi (13.8 MPa) while pulling full vacuum, completely independent from vacuum system, with ability to vary vacuum without affecting water pressure.

2.03 WATER

A. When water from fire hydrants is necessary, apply to Owner for permission to use potable water source. When Contractor has been authorized to take water from fire hydrants:

B. Water shall be conserved and not used unnecessarily.

C. Only Owner-approved fire hydrant wrenches and shut off valves shall be used.

D. A visible air gap shall be maintained between the discharge of the fire hose and the Contractor's water storage tank. The air gap shall be visible from the ground surface.

1. If an air gap is not possible, Contractor shall provide a backflow preventer that has been approved by Owner.

2.04 NO FIRE HYDRANT SHALL BE OBSTRUCTED EXCEPT TO REFILL EMPTY WATER TANKS.

A. Contractor shall provide temporary piping, valves, certified reduced pressure backflow preventers, equipment, and other items for handling potable water and wastewater approved by Owner.

B. Do not utilize water source until it has been approved for use by Owner.

PART 3 EXECUTION

3.01 GENERAL

A. Contractor shall clean the sewer and associated manholes, including drop connections and benches, to remove Deposits Settled (DS), so that the sewer is ready for televising. This will require an unlimited amount of passes of a hydraulic flusher to remove all loose debris and collect it for removal in the downstream manhole. Debris must be removed from the sewer, including any debris that may have been washed up into any service connections (does not include known pre-existing conditions in service connections), drop connections or the bench wall of the manholes. This item does not include any root cutting, deposit removal, or grinding of protruding service connections.

B. Cleaning shall be performed while the line segments are in service without the need for plugging or flow diversion unless previously approved by Engineer. If necessary, Contractor shall schedule the work to be performed late at night between the hours of 11:00 PM and 6:00 AM. Late night cleaning work shall not begin until Contractor has received approval from Owner for a nighttime traffic control plan submitted by Contractor.

3.02 MAINTENANCE OF TRAFFIC

A. Contractor shall be responsible for maintaining "local" traffic at all times and for notifying the proper authorities regarding the closing of the roads. Contractor will be responsible for obtaining all permits required for maintenance of traffic.

B. Contractor shall not begin work until standard barricades and warning signs are in an acceptable position and the markers and signs conform to the traffic control plans detailed in the Contract Drawings and the latest edition of the Michigan Manual of Uniform Traffic Control Devices, and all applicable state and local requirements of the agency having authority over the roadways, or as directed by the Professional. Contractor assumes all responsibilities and liabilities regarding strict adherence to applicable sections for the maintenance of traffic and public safety as set forth in the Michigan Manual of Uniform Traffic Control Devices, and other applicable regulations. Traffic control devices must be in place prior to starting work.

C. Contractor shall maintain local traffic at all times during all phases of this project in a manner causing the least amount of inconvenience to the abutting property owners. Temporary driveways, temporary roadways, or run around as may be necessary to provide vehicular access to and from the abutting properties shall be constructed, maintained, and subsequently removed by Contractor as directed by Owner and/or Engineer.

D. The portion of the pavement not affected by the work shall be kept clear of all material and equipment. If at any time traffic has to be blocked (emergencies only), Contractor shall notify the nearest fire, police departments and service departments.

E. The cost of maintenance of traffic shall be incidental to the contract and not measured for payment unless otherwise indicated.

3.03 EXISTING UTILITIES

A. Contractor must take the necessary precautions for the protection of any utility encountered on the project or the restoration of any utility damaged during the work.

B. If an excavation is required, Contractor shall notify, at least 48 hours before breaking ground, all public or private service corporations having wire, poles, pipes, conduit, manholes, or other structures that may be affected by this operation, including all structures which are affected and not shown on these plans. Owners of underground utilities, which are members of the state's one call service, can be notified by calling. Non-member underground utility owners must be called directly.

C. Maintenance, repair, and replacement of existing utilities shall be in accordance with the rules and regulations of the various utility companies having jurisdiction.

D. Existing storm sewers, driveway drains, surface drain pipes and other property, removed or damaged during construction shall be repaired and reconnected by Contractor as directed by Owner at no additional cost.

3.04 MAINTAINING FLOW

A. It will be the responsibility of Contractor, throughout the tenure of this Contract, to provide and maintain sufficient flow at all times to pass any flash of flow and prevent any backwater flooding due to obstruction caused by cleaning equipment.

B. Contractor shall be aware of flow conditions and be able to identify potential access problems to sewer access points.

3.05 SEWER CLEANING

A. Contractor shall provide equipment that is specifically designed and constructed for sewer cleaning. Solids and debris resulting from the cleaning operation shall be collected and removed from the downstream manhole and disposed of at a site selected by Owner and approved by appropriate jurisdictional personnel. Under no circumstances shall sewage solids be dumped onto the surface, street, or into ditches, inlets, or storm drains.

B. Contractor shall use the manufacturer's recommended size tools for the various size pipes. Equipment recommended by the manufacturer to protect the manhole and pipe, such as pull-in slant jack rollers and roller and yoke assembly, roller manhole jacks, etc. shall be utilized.

C. Contractor shall clean designated sewer lines using approved methods and equipment.

1. Contractor shall have a CCTV camera in the sewer during all cleaning operations to verify that the cleaning equipment is not damaging the public sewer. The use of CCTV equipment shall be in accordance with Section 33 0130.16, Television Inspection of Sewer Pipelines.

2. Remove internal obstructions such as roots or gaskets by trenchless techniques when obstruction encountered prevents further pipe cleaning.

    a. Provide special attention during cleaning operation to assure almost complete removal of roots from joints.

b. Procedures to remove internal obstructions may include use of equipment such as rodding machines, root saws, bucket machines and winches using root cutters, porcupines, and jet machines equipped with hydraulically driven cutters.

3. If cleaning of entire section cannot be successfully performed from one manhole, set up equipment at other manhole and attempt cleaning again.

   a. If successful cleaning cannot be performed or equipment fails to traverse entire sewer line section, it will be assumed that major blockage exists.

   b. Temporarily suspend cleaning effort and immediately notify Owner and Engineer.

   c. Upon removal of obstruction, complete cleaning operation.

4. Employ satisfactory precautions to protect sewer line from damage that might be inflicted by improper use of cleaning equipment.

   a. Immediately notify Owner and Engineer if fresh soil, pieces of pipe, or other visible signs of potential problems occur during cleaning operation.

   b. Ensure that water pressure created does not cause damage due to flooding of property being served by sewer section(s) involved.

5. Contractor is required to submit documentation of the work that is performed and the type of debris removed, as well as landfill permits and disposal documentation.

3.06 MANHOLE CLEANING

A. Include entire manhole interior, including manhole benches and walls. Incorporate into line cleaning operation by scouring walls with high velocity nozzle after pipe segment cleaning operation is complete.

3.07 REMOVAL OF DEBRIS

A. Sludge, dirt, rocks, sand, grease and other solids or semisolid materials resulting from cleaning operations shall be trapped and removed at the downstream manhole of the section being cleaned.

B. Passing materials from manhole section to manhole section, which could cause line stoppage, accumulations of sand in wet wells or damage to pumping equipment, shall not be permitted.

C. Solids or semi-solid material removed from the wastewater collection system during the cleaning operation shall be removed from the site and disposed of in a lawful manner. Do not discharge sewage or solids removed from downstream manholes, onto streets, or into ditches, catch basins or storm drains.

3.08 PROPERTY DAMAGE

A. Contractor shall immediately investigate any and all reports of sewage backing up into fixtures served by the sewer section that is being cleaned or televised.

B. Contractor will be required to notify both Owner and Engineer immediately if he causes any damage to private or public property caused by activities related to this contract. Contractor shall make repairs and/or clean the property immediately in a timeframe that is acceptable to Owner.

3.09 CLEANUP

A. Contractor shall keep the work area in an uncluttered condition by the frequent removal of debris. Contractor shall remove all debris and unused material and leave the area in a condition similar to the condition of the area before any work was performed.

END OF SECTION

SECTION 33 05 07 - UTILITY HORIZONTAL DIRECTIONAL BORING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The work specified in this section consists of furnishing and installing underground utilities using the horizontal directional drilling (HDD) method of installation, also commonly referred to as directional boring. This work will include services, equipment, materials, and labor for the complete and proper installation; testing; restoration of underground utilities; environmental protection; and restoration.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 89 00 - Site Construction Performance Requirements

C. Section 31 23 16 - Structural Excavation and Backfill

D. Section 31 23 33 - Trenching and Backfilling

E. Section 33 14 00 - Water Utility Distribution Piping

1.03 QUALITY ASSURANCE

A. Contractor will be responsible for the complete design of all methods used for directional boring including the implementation of all materials, tools, labor, and equipment proposed for use in the Work. Requirements set forth in this document specify a wide range of procedural precautions necessary to ensure that the very basic, essential aspects of a proper directional bore installation are adequately controlled. Adherence to the specifications contained herein, or the Engineer's approval of any aspect of any directional bore operation covered by this specification, will in no way relieve the Contractor of their ultimate responsibility for the satisfactory completion of the work authorized under the Contract.

B. Requirements of Regulatory Agencies:

1. Federal, State, and Local Regulations:

    a. Conform to the requirements of all federal, state, and local regulatory agencies having jurisdiction.

2. Permits and Inspections:

    a. Where applicable, obtain and pay for permits and inspections for pipe directional boring operations as required by PA 451, State of Michigan, 1994, and all government and private agencies having jurisdiction. No additional compensation will be allowed because of the Contractor's failure to obtain and pay for such permits and inspections. Be aware of and conform with Owner-obtained permits.

3. Occupation Health and Safety Requirements:

    a. Conform to the requirements of the Michigan State Department of Labor, Construction Safety Standards Commission Construction Standard, Part 14; Tunnels, Shafts, Caissons and Cofferdams, and the Michigan State Department of Public Health,

Occupational Health Standards Commission, Occupational Health Standards, Part 2; Tunnels, Shafts, Caissons and Cofferdams.

1.04 REFERENCE STANDARDS

A. Work shall conform to appllicable provisions of the Contract Documents and to the latest edition of the following standards, except as modified in this Section:

1. ASTM F1962-22: Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings
2. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
3. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
4. ASTM C139 - Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes
5. ASTM D1784 - Standard Classification System and Basis for Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
6. ASTM D2447 - Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter
7. ASTM D2657 - Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings
8. ASTM D3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
9. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
10. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
11. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
12. ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter
13. ASTM F1055 - Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing
14. ASTM F2160 - Standard Specification for Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD)
15. ASTM F2164 - Standard Practice for Field Leak Testing of Polyethylene (PE) and Crosslinked Polyethylene (PEX) Pressure Piping Systems Using Hydrostatic Pressure
16. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
17. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast

18. AWWA C153/A21.53 - Ductile-Iron Compact Fittings
19. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings
20. AWWA C651 - Disinfecting Water Mains
21. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm)
22. AWWA C906 - Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm), for Waterworks
23. NEMA TC 7
24. NSF 14 - Plastics Piping System Components and Related Materials
25. Michigan Department of Transportation, Standard Specifications for Construction, latest edition

1.05 SUBMITTALS

A. Prior to beginning Work, Contractor will prepare and submit to the Engineer for review, detailed plans and shop drawings showing the limits of the proposed directional boring Work; the materials, equipment and methods of construction proposed for use; the connection including all thrust blocking and bracing of the directionally bored carrier pipe to other pipe; the location of shafts, pits and/or approach tunnels to be constructed; the locations of existing utilities; the proposed bore path, and methods to be implemented for protection of personnel, excavations and adjacent structures, property and utilities.

B. Prior to beginning directional boring operations, submit copies of permits and inspection records obtained from state and local authorities having jurisdiction as described under Part 1 of this Section.

1.06 QUALIFICATIONS

A. Contractor will have actively engaged in the installation of pipe using directional drilling for a minimum of seven (7) years and have installed a minimum of 35,000 feet.

B. Field supervisory personnel employed by the Contractor will have at least 7 years' experience in the performance of the work and tasks as stated in the Contract Documents.

C. Polyethylene pipe jointing wil be performed by personnel trained in the use of butt-fusion joining equipment and electro-fusion joining equipment. Training will be performed by a qualified representative of the joining equipment and documented in writing.

1.07 JOB CONDITIONS

A. Where soil conditions or obstructions are encountered that prevent the completion of pipe directional boring Work started or in progress, develop and submit to the Engineer for review alternate methods of performing the Work as described under Part 1 of this Section. Perform no additional Work until completion of review by the Engineer of the alternate method proposed.

B. Protection

1. Provide structures, safety equipment and professional services required to provide for the health and safety of the general public and of personnel involved in pipe directional boring Work in accordance with the requirements of the regulatory agencies having jurisdiction.
2. Take measures necessary to protect surrounding public and private property, adjacent buildings, roads, drives, sidewalks, drains, sewers, utilities, structures, and appurtenances from damage due to pipe directional boring Work. Responsibility and payment for correction of such damage will be the sole responsibility of Contractor.
3. Pothole existing underground utilities including sanitary sewers, sanitary leads, storm sewers, water mains, water services, gas mains, gas services, telephone lines, cable television lines, oil lines, etc. to ascertain the clearance between the existing utilities and the pipe to be bored and to ensure the pipe boring will not adversely affect the existing utilities. Potholing is required and will not be paid for separately unless otherwise specified in the Proposal.

PART 2 PRODUCTS

2.01 GENERAL

A. Directional drilling equipment will consist of a directional drilling rig of sufficient capacity to perform the bore and pullback the pipe, a drilling fluid mixing and delivery system of sufficient capacity to successfully complete the crossing, a guidance system to accurately guide boring operations and trained and competent personnel to operate the system. Equipment will be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.

2.02 DRILLING RIG

A. Directional drilling machine will consist of a hydraulically powered system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine will be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the crossing. The hydraulic power system will be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system will be free of leaks. Rig will have a system to monitor and record maximum pull-back pressure during pull-back operations. The rig will be grounded during drilling and pull-back operations.

2.03 DRILLING SYSTEM

A. The drill head will be steerable by changing its rotation and will provide the necessary cutting surfaces and drilling fluid jets.

B. Mud motors will be of adequate power to turn the required drilling tools.

C. Drilling system will be constructed of high quality 4130 seamless tubing, grade D or better, with threaded box and pins. Tool joints should be hardened to 32-36 RC.

2.04 GUIDANCE SYSTEM

A. Magnetic Guidance System (MGS) or proven gyroscopic system will be used to provide a continuous and accurate determination of the location of the drill head during the drilling

operation. The guidance will be capable of tracking at depths up to one hundred feet and in any soil condition, including hard rock.

B. The MGS will enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction). The guidance system will be accurate to +/- 2% of the vertical depth of the borehole at sensing position at depths up to one hundred feet and accurate within 18-inches horizontally.

C. The MGS will be of a proven type and will be operated by personnel trained and experienced with this system. MGS operator will be aware of magnetic anomalies on the surface of the drill path and will consider such influences in the operation of the guidance system if using a magnetic system.

2.05 DRILLING FLUID (MUD) SYSTEM

A. A self-contained, closed, drilling fluid mixing system will be of sufficient size to mix and deliver drilling fluid. Mixing system will continually agitate the drilling fluid during drilling operations.

B. Drilling Fluids:

1. Drilling fluid will be composed of clean water and appropriate additives including bentonite clay. Water will be from an authorized source with a pH of 8.5 to 10. Water of a lower pH or with excessive calcium will be treated with the appropriate amount of sodium carbonate or equal. The water and additives will be mixed thoroughly and be absent of clumps or clods. No potentially hazardous material may be used in drilling fluid.

2. The mud pumping system will be of an adequate capacity for delivering the drilling fluid at a constant pressure suitable for the Work. The delivery system will have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe will be relatively leak-free. Used drilling fluid and drilling fluid spilled during drilling operations will be contained and conveyed to the drilling fluid recycling system. A berm, a minimum of 12-inches high, will be maintained around drill rigs, drilling fluid mixing system, entry and exit pits and drilling fluid recycling system to prevent spills. Pumps and or vacuum truck(s) of sufficient size will be in place to convey excess drilling fluid from containment areas to storage and recycling facilities.

3. The drilling fluid recycling system will separate sand, dirt and other solids from the drilling fluid to render the drilling fluid re-usable. Spoils separated from the drilling fluid will be stockpiled for later use or disposal.

2.06 OTHER EQUIPMENT

A. Pipe rollers will be of sufficient size to fully support the weight of the pipe while being hydro-tested and during pull-back operations. Sufficient number of rollers will used to prevent excess sagging of pipe.

2.07 HDPE WATER MAIN PIPE SYSTEM

A. See 33 11 00 Water Utility Distribution Piping for open cut pipe installation application.

B. Pipe:

1. AWWA C906, DR 11 (Pressure Class 200), Ductile Iron Pipe size. All HDPE materials must be listed and approved for use with potable water under ANSI/NSF standard 14. AWWA C906 and the “NSF-pw” identification.

C. Material: PE 4710

D. Cell Classification: 445474C per ASTM D3350

E. Fittings:

1. Ductile iron fittings (where shown on the Plans) will be mechanical joint, ductile iron compact fittings conforming to AWWA C153/A21.53, with rubber gasket joints conforming to AWWA C111/A21.11, with double thickness cement mortal lining and coal tar epoxy coating on the outside of the fittings. Joining ductile iron fittings to HDPE pipe will use fused mechanical joint adapters with ductile iron backup rings.

2. HDPE Fittings (tees, crosses, bends, etc.) and plugs will be Butt Heat Fusion Type, DR 11, per ASTM D3261 or Electrofusion Type, per ASTM F1055. Compression fittings are not allowed.

F. Pipe Joints: Butt Fusion Welded or Electrofusion Welded.

G. Valves and Hydrants:

1. As specified in Section 33 1100, Water Utility Distribution Piping.

2. Hydrant leads from the hydrant tee to the hydrant will be ductile iron pipe, AWWA C151, Class 54, PC 350, unless indicated otherwise on the plans.

a. Fittings for joining HDPE pipe to hydrant lead shall be restrained joint for HDPE pipe designed for a working pressure of 200 psi.

H. Water Service Taps:

1. Electrofusion corporation saddles with 1-inch brass outlet threads and brass corporation stops.

2. Stainless Steel, full circle, double bolt service saddle with spring washers and 1-inch brass outlet threads and designated by the manufacturer in writing as specifically approved for use on HDPE pipe; with brass corporation stops.

I. Allowable Leakage:

1. Pipe will be tested at 150 psi for 1 hours per ASTM F2164. Leakage allowance for fused HDPE pipe joints is zero. The leakage allowance per joint for gasketed fittings (based upon 150 psi test pressure) is as follows:

Pipe Diameter	**6”**	**8”**	**10”**	**12”**	**14”**
Gal / Hour	0.010	0.013	0.017	0.020	0.023

2.08 HDPE FORCE MAIN PIPE SYSTEM

A. Pipe:

1. Polyethylene, Nominal IPS OD, DR-11, Pressure Rating 200 psi, pipe less then 3-inch diameter will be in accordance with ASTM D3035 , pipe 3-inches and larger will be per ASTM F714.

B. Material: PE 4710

C. Cell Classification: PE 345464C per ASTM D3350

D. Joints: Heat Fusion Bonding, ASTM D2657 or Electrofusion Welded

E. Fittings:

1. Fittings (tees, crosses, bends, sleeves, etc.) and plugs, where shown on the Plans, will be Butt Heat Fusion Type, DR 11, per ASTM D3261 or Electrofusion Type, per ASTM F1055. Fittings for joining HDPE pipe to ductile iron or PVC AWWA C900 pipe or fittings will use fused mechanical joint adapters with ductile iron backup rings.

F. Allowable Leakage:

1. Allowable Leakage: Pipe will be tested at 150 psi for 1 hours per ASTM F2164. Leakage allowance for fused HDPE pipe joints is zero. The leakage allowance per joint for gasketed fittings (based upon 150 psi test pressure) is as follows:

Pipe Diameter	**6”**	**8”**	**10”**	**12”**	**14”**
Gal / Hour	0.010	0.013	0.017	0.020	0.023

2.09 TRACER WIRE

A. Reinforced 7 x 7 stranded copper clad steel wire with 50 mil High Density Polyethylene insulation. Continuous copper cladding metallurgically bonded to a steel core through a continuous solid cladding process. Bare wire 0.208-inch O.D., 4700 pounds breaking strength. Wire to be Copperhead® or equal.

2.10 OTHER MATERIALS

A. Concrete:

1. Concrete will conform to MDOT Section 1004, use Grade 3000 concrete; Type IA cement; MDOT 6A coarse aggregate; MDOT 2NS fine aggregate; 3 inch maximum slump; no admixtures without the Engineer's approval.

B. Concrete Reinforcement:

1. In accordance with MDOT Section 905, use ASTM A615/A615M, Grade 60 for bars and ASTM A1064/A1064M for welded wire fabric.

C. Concrete Block:

1. Block cast from Portland cement sand, gravel or crushed stone, of uniform and compact texture, free from cracks or warpage and with square corners conforming to ASTM C139.

PART 3 EXECUTION

3.01 VERIFICATION

A. Prior to performing directional boring operations, verify grades, lines and levels to which the new Work is to be installed. Directional boring Work that requires adjustment of grades, lines and levels after Work has started will be at the expense of the Contractor performing the Work.

B. Prior to beginning directional boring Work, contact the local one call system for locating buried utilities (811). Also contact the local municipalities who may not be part of the one call system, to mark their buried facilities. Excavate or pothole to verify in the field the location and elevation of existing active utilities and structures scheduled to remain and requiring protection from damage because of the Work. Existing utilities will include gas mains and services, water mains and services, sanitary sewers and house leads, oil lines, telephone lines and services, cable television lines and services, electric lines and services, and any other similar buried utilities.

C. Plan and plot a bore path and submit bore path to Engineer in accordance with Part 1 of this Section. Notify the Engineer where existing utilities directly affect the progress or performance of the Work. Contractor is responsible for excavation or potholing necessary to determine the elevation of existing utilities that cross the proposed water main at no additional cost to the Project unless otherwise indicated in the Proposal.

3.02 PREPARATION

A. Layout of the Work:

1. Stake, mark, and layout the Work using suitable stakes and markers to facilitate verification of grades, lines, levels, and locations of the Work to be performed in a manner acceptable to the Engineer.

2. From reference points established by the Engineer on the surface of the ground, carry line and grade down to the bottom of any shafts or boring pits. Perform the Work to the line and grades established using methods acceptable to the Engineer. Protect such reference points throughout the progress of the Work.

B. Examination of Materials:

1. Prior to performing directional boring Work, examine new pipe for damage due to fabrication, shipment, or handling. Inspect pipe for cracks, breaks, bends, dents, broken ends, or other damage which might affect the structural integrity, performance requirements, or jointing as shown on the Plans, specified herein or as directed by the Engineer. Defective pipe will be rejected by the Engineer and will be removed from the Work and replaced with acceptable pipe at the expense of the Contractor.

C. Notifications:

1. Prior to performing directional boring Work, Contractor will notify applicable inspecting agencies under Part 1 of this Section, of Work Schedule with a minimum of two (2) working days' notice.

3.03 INSTALLATION

A. Except for the method of installation (directional boring versus open cut), the pipe will be installed per requirements of Section 33 11 00 Water Utility Distribution Piping.

B. Sheeting, Shoring, and Bracing:

1. Furnish, install and maintaining throughout the progress of the Work, such sheeting, shoring, and bracing in tunnels, shafts, pits and trenches as may be required for safety of workmen, for protection of the Work and adjacent structures, and for issuance of applicable agency permits. Sheeting, shoring, and bracing will be removed after completion of the Work unless otherwise indicated on the Plans or directed by the Engineer.

2. Design of earth supports will be the responsibility of the Contractor and will be as required by the nature of the soils encountered. Supports will be dimensioned and spaced as to prevent caving, loss of earth or squeezing within the neat lines of the excavation. Supports will effectively restrain movement of the adjacent soil.

3. The sheeting of pits along roads will be required if the leading edge of the pits falls within the one-on-one zone of influence from the shoulder point or curb and gutter edge.

C. Excavation:

1. Excavate as required to perform directional boring Work to the grades, lines and levels indicated on the Plans and as specified herein.

2. Construct approach trenches, pits and shafts of sufficient length and width to accommodate the equipment being used, the pipe units to be placed and the manpower working. Provide guide timbers or rails in the bottom of the trenches, pits and shafts for keeping the Work on line and grade.

D. Pipe:

1. Construction:

a. Use the types and sizes shown on the Plans. Contractor will construct the pipe on the surface in the area indicated on the Plans. Use care to not damage pipe, joints or joint material. Coiled HDPE pipe will be re-rounded before using.

2. Connection to Structures and Existing Water Mains:

a. Final connections of HDPE pipe to existing water mains will be made after the new HDPE pipe has been allowed to relax for a minimum of 24 hours. Connections of HDPE pipe to existing water mains will consist of a full-circle Flex Restraint Collar fused to the HDPE pipe embedded in a 30” x 30” concrete thrust block poured to undisturbed earth placed a maximum of 5-feet from the connection point.

3. Hydrostatic Testing:

a. The pipe will be hydrostatically tested twice for leakage, including a preliminary test after the pipe has been constructed on the surface, and an acceptance test after the pipe has been installed in the drilled hole. Contractor will furnish the pump, pipe connection, valves and other necessary apparatus including gauges, meters, and personnel necessary for conducting the test.

1) Hydrostatic testing for HDPE pipe will be in accordance with ASTM F2164.

2) Before applying the test pressure, air willll be expelled from the pipe. If necessary to accomplish this, taps will be made at points of higher elevation and afterwards plugged.

3) Allow the test section to equalize to a common temperature and pressure. Gradually increase pressure to required test pressure.

4) HDPE pipe will be held at the test pressure for 4 hours prior to beginning the test to allow for stabilization of expansion of the pipe under test pressure.

5) Full pressure will be held for the length of time as specified in Part 2 of this Section.

6) Faulty pipe fitting, valves or other accessories which permit leaks during testing will be replaced by the Contractor with sound material and the test will be repeated until specified requirements are met.

7) If no visual leakage is observed, and pressure during the test phase remains steady (within 5 % of the test phase pressure) for the entire test period, a passing test is indicated.

8) The maximum permissible leakage measured by water meter from the section of main tested under pressure, will not exceed the rate as specified in Part 2 of this Section.

9) If retesting is necessary, depressurize the test section and correct faults or leaks in the test section.

10) Test sections will normally not exceed 2,000 ft, and in the event more than 2,00 mile of water main is tested, the permissible leakage will remain at the amount determined for 1 mile of pipe.

4. Water for Testing:

   a. Water for testing will be obtained from a potable water supply. Contractor will provide water required at Contractor's own expense and Contractor will make the necessary arrangements with the authority which controls the source of water system for water. Contractor will be governed in using the water by the rules and regulations imposed thereon by said authority.

   b. Contractor will provide and remove temporary connections between the source water system and the mains constructed under this Contract. Temporary connections will meet the approval of the Engineer, the authority controlling the source water system, and public health authorities having jurisdiction.

5. Installation:

   a. After satisfactory hydrostatic testing, the Contractor will install pipe with continuous pullback until the pipe is in place as indicated on the plans. No connections to the pipe will be made for a period of 24 hours after the continuous pullback has been completed.

6. Installing Fittings (fire hydrants, gate valves, tees, crosses, etc.):
    a. Where required, fittings will be cut into the new pipe after it is bored and allowed to relax sufficiently. The new pipe will be excavated and precision cut.
    b. Connections of HDPE pipe to mechanical joint fittings will use mechanical joint adapters with ductile iron backup rings fusion welded to each end of the pipe.
7. Disinfection:
    a. Water main will be disinfected per AWWA C651. Bacteriological analysis and sampling will be in accordance with AWWA C651 and Section 33 14 00 - Water Utility Distribution Piping.
    b. For HDPE pipe, disinfection with solutions containing chlorine will not contain more than 12.5% active chlorine.
8. Water Services Connections:
    a. Water services connections will be:
        1) For HDPE pipes, electrofusion corporation saddle with 1-inch brass outlet threads and brass corporation stops as noted above. Water service material shall be 1 inch Type K Copper.
9. Tracer Wire:
    a. Tracer wire will be installed end to end or structure to structure for directionally drilled pipe. Contractor will ensure integrity of the wire is not compromised during pull back. Dis-continuity of the wire will require a new, continuous wire being pulled in over the path of the water main.

3.04 DRILL PATH SURVEY

A. Entire drill path will be accurately surveyed with entry and exit stakes placed in the appropriate locations within the areas indicated on Drawings. If Contractor is using a magnetic guidance system, drill path will be surveyed for surface geo-magnetic variations or anomalies. Submit completed bore path complete with line and grade references and pulling loads imposed to Engineer at completion of directional boring Work.

3.05 DRILLING PROCEDURE

A. Pilot hole will be drilled on bore path with no deviations greater than 5% of depth over a length of 100 feet. In the event that pilot does deviate from bore path more than 5% of depth in 100 feet, Contractor will notify Engineer and Engineer may require Contractor to pull-back and re-drill from the location along bore path before the deviation.

B. In the event that a drilling fluid fracture ("frac out"), inadvertent drilling fluid returns, or drilling fluid loss occurring during pilot hole drilling operations, Contractor will cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a March funnel and then wait another 30 minutes. If mud fracture or returns loss continues, Contractor will cease operations and notify Engineer. Engineer and Contractor will discuss additional options and work will then proceed accordingly.

C. Upon successful completion of pilot hole, Contractor will ream bore hole to the minimum amount necessary to accommodate outside diameter of pipe. Contractor will not attempt to ream at one time more than the drilling equipment and mud system are designed to safely handle.

D. After successfully reaming bore hole to the required diameter, Contractor will pull the pipe through the bore hole using a swivel in front of the pipe. Once pull-back operations have commenced, operations must continue without interruption until pipe is completely pulled into bore hole. During pull-back operations Contractor will not apply more than the maximum safe pipe pull pressure at any time.

E. In the event that pipe becomes stuck, Contractor will cease pulling operations to allow any potential hydro-lock to subside and will commence pulling operations. If pipe remains stuck, Contractor will notify Engineer. Engineer and Contractor will discuss options and then work will proceed accordingly.

3.06 PULLING LOADS

A. The maximum allowable tensile load imposed on the pipeline pull section will not exceed the following amounts:

1. Allowable Tensile Load:

Nominal Size	HDPE
1-1/4”	860 lbs.
2”	1,875 lbs.
3”	4,072 lbs.
4”	6,879 lbs.
6”	14,215 lbs.
8”	24,455 lbs.
10”	36,788 lbs.
12”	52,025 lbs.
14”	69,895 lbs.
16”	90,399 lbs.
18”	113,536 lbs.
20”	139,306 lbs.
24”	198,748 lbs.
30”	305,748 lbs.

B. The amount of pull applied to the pipe will be controlled and limited by devices such as hydraulic pressure regulator or a load sensor between the pulling equipment and the pipe.

3.07 PIPE TESTING

A. Following successful pull-back of pipe, Contractor will hydrostatic test the pipe per the requirements of this Section. After successful completion of hydrostatic test, pipe will pigged dry.

B. After completion of hydrostatic test and before connection to the water supply, the pipe will be chlorinated and tested per the requirements of AWWA C651 and Section 33 14 00 - Water Utility Distribution Piping.

3.08 BACKFILLING

A. After the pipe has been installed and approved by the Engineer, the Contractor will backfill the entrance/exit pits, approach trenches or shafts. The entrance/exit pits, approach trenches or shafts and other excavations, will be considered as open cut trench and will be backfilled as specified in Section 31 23 33 - Trenching and Backfilling. Special backfill will apply where they exceed the maximum allowable trench width.

3.09 ACCEPTANCE AND INSPECTION

A. Contractor will maintain line and grade and will provide the Engineer with as-built location at five-foot intervals. If unable to maintain line and grade or to maintain directional boring operations, Contractor will propose alternate methods of construction as specified under Part 1 of this Section to complete the Work.

B. Water main will be inspected and accepted under Section 33 14 00 - Water Utility Distribution Piping.

C. If excavation or installation Work done by the Contractor is to be abandoned or not completed, the Contractor will fill voids and spaces caused by the abandoned Work, as directed by the Engineer.

3.10 RECORD KEEPING, AS-BUILTS

A. Contractor will maintain a daily project log of drilling operations and a guidance system log with a copy given to Engineer at completion of project. As-built drawings will be certified as to accuracy by Contractor.

END OF SECTION

SECTION 33 05 09 - PIPE BURSTING PRE-CHLORINATED HDPE PIPE FOR WATER MAIN

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This section describes pre-chlorinated high-density polyethylene (HDPE) pipe, including acceptable fusion technique and practice, safe handling and storage, and installation of the pipe by pipe bursting methods.

B. The pipe is intended to be installed in sections that can be completed on a daily basis; such that all water services are reconnected to the new main and no section of water main and no water services out of service more than 10 hours.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 33 00 - Submittal Procedures

B. Section 31 23 16 - Structural Excavation and Backfill

C. Section 33 14 00 - Water Utility Distribution Piping

1.03 REFERENCE STANDARDS

A. Work shall conform to applicable provisions of the Contract Documents and to the latest edition of the following standards, except as modified in this Section:

1. ASTM D3261: Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
2. ASTM D3350: Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
3. ASTM F1055: Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing
4. ASTM F2164: Standard Practice for Field Leak Testing of Polyethylene (PE) and Crosslinked Polyethylene (PEX) Pressure Piping Systems Using Hydrostatic Pressure
5. AWWA C111/A21.11: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
6. AWWA C151/A21.51: Ductile-Iron Pipe, Centrifugally Cast
7. AWWA C153/A21.53: Ductile-Iron Compact Fittings
8. AWWA C651: Disinfecting Water Mains
9. AWWA C622-19: PIPE BURSTING OF POTABLE WATER MAINS 4 IN. (100 MM) TO 36 IN.
10. AWWA C900: Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm)
11. AWWA C906: Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm), for Waterworks

12. AWWA M23: PVC Pipe—Design and Installation

1.04 DESCRIPTION

A. Pipe bursting water mains using Pre-Chlorinated HDPE Pipe will repeat the method, outlined below for each section of pipe being rehabilitated. These processes may be performed in series or in parallel with other sections of pipe within the job; however, each section will require these steps.

1. Deliver notice of service outage to each affected property owner in advance of work.
2. Chlorinate a length of product pipe that yields passing test results for potable water per AWWA C651, Regulatory Authority, and Township standards. Two consecutive bacteriological samples collected 24 hours apart shall be collected, tested, and reported as “Non-detect” from a certified lab before the pipe may be installed.
3. Hydrostatic test of the pipe section per ASTM F2164 requirements.
4. Excavate a Burst Pit at one end of the section down to pipe grade for placement of the pipe bursting equipment.
5. Excavate an Insertion Pit at the opposite end of the section down to pipe grade for initial entry of the rod string.
6. Excavate service connection pits.
7. Isolate the section to be rehabilitated from the rest of the system so as to maintain pressure integrity of the system as well as preventing any backflow of chlorinated solution or non-potable water into the system.
8. Excavate and remove bends, tees and valves from the host pipe.
9. Assemble rod string feed it through the host pipe from Insertion Pit to Bursting Pit.
10. Attach bursting tools and new water main pipe to rod end at Bursting Pit.
11. Pull rod string back while simultaneously bursting existing pipe and pulling the new water main into the void.
12. Reattach service connections to the newly installed main. Close water services at stop box until main has been super-chlorinated and flushed to prevent resident exposure to high doses of chlorine.
13. Super-Chlorinate main for 15 minutes to 300 ppm. A de-chlorination unit shall be used to neutralize the residual chlorine when flushing. Flush the newly installed main with potable water. After flushing, collect bacteriological samples at each sample site and confirm the absence of coliforms by laboratory analysis.
14. Inspect for leaks at new connections.
15. Make final connection of the new water main to the existing water system.
16. A 24-hour “Boil Water” advisory shall be issued to all residents in the affected area.
17. The new water main shall be fed from only one direction until the water has been determined to be total coliform free.

B. It should be noted that items “7” through “17” are to be accomplished within a single 10-hour day to eliminate the need for any temporary services, as described in Section 33 11 00 paragraph 3.32.C. The length of pipe to be burst per run (day) should be chosen to conform to this time frame. Items "4" through "6" (excavation items) may be performed one day prior to bursting operations to expedite process.

1.05 REQUIREMENTS

A. Contractor shall provide a structurally sound, leak-proof, monolithic water main pipe for all piping identified for installation by pipe bursting methods. Individual pipe lengths shall be assembled by butt-fusion unless otherwise specified. Connecting fittings shall be fused to the piping as specified. The full length of the pipe shall be pressure tested and bacteriological tested and approved by the Engineer prior to bursting and installing the pipe.

1.06 QUALITY ASSURANCE

A. Qualifications:

1. Prior to bidding the Contractor shall have documented experience of a minimum of 3 years and 50,000 linear feet of pipe bursting with any material and a minimum of 5,000 linear feet of successful pipe bursting with Pre-Chlorinated HDPE water main systems installations in the U.S.

2. Contractor shall submit to the Engineer prior to the preconstruction meeting, certification by the pipe bursting equipment manufacturer that such company is fully trained in the use of the pipe bursting system.

3. Fusible HDPE pipe jointing shall be performed by personnel trained and certified by the pipe manufacturer in the use of butt-fusion and electro-fusion equipment and recommended methods for new pipe connections. Personnel directly involved with installing the new pipe shall receive training in the proper methods for handling and installing the HDPE pipe.

4. Contractor must coordinate with the Engineer to establish a schedule indicating the linear feet of pipe bursting installation feasible in a day, based on existing conditions.

B. Fusion Technician Requirements:

1. Fusion Technician shall be fully qualified by the pipe supplier to install fusible HDPE pipe of the type(s) and size(s) being used. Qualification shall be current as of the actual date of fusion performance on the project.

1.07 SUBMITTALS

A. Product Data:

1. Name of the pipe manufacturer and a list of the piping and quantities to be provided by manufacturer.

2. Product data and pipe supplier data indicating conformance with this specification and applicable standards, including written documentation regarding any intended variance from this specification and applicable standards. This will include experience of pipe supplier by years and number of projects; warranty information; and independent laboratory testing certification.

3. Pipe certification and testing in conformance with this specification and applicable standards indicating conformance from the pipe extruder per AWWA C906.

B. Fusion Report:

1. Fusion report for each fusion joint performed on the project, including joints that were rejected. Specific requirements of the Fusion Technician's joint report shall include:

a. Pipe Size and Dimensions

b. Machine Size

c. Fusion Technician Identification

d. Job Identification Number

e. Fusion Number

f. Fusion, Heating, and Drag Pressure Settings

g. Heat Plate Temperature

h. Time Stamp

i. Heating and Cool Down Time of Fusion

j. Ambient Temperature

1.08 JOB CONDITIONS

A. Soil Conditions:

1. Where soil conditions or obstructions are encountered that prevent the completion of pipe bursting Work started or in progress, develop and submit to the Engineer for review alternate methods of performing the Work. Perform no additional Work until completion of review by the Engineer of the alternate method proposed.

B. Protection:

1. Personnel:

a. Provide structures, safety equipment and professional services required to provide for the health and safety of the general public and of personnel involved in pipe bursting Work in accordance with the requirements of the regulatory agencies having jurisdiction.

2. Property, Utilities, and Structures:

a. Take all measures necessary to protect surrounding public and private property, adjacent buildings, roads, drives, sidewalks, drains, sewers, utilities, structures, and appurtenances from damage due to pipe bursting Work. Responsibility and payment for correction of such damage shall be the sole responsibility of Contractor.

3. Potholing:

a. Pothole existing underground utilities including sanitary sewers, sanitary leads, storm sewers, water mains, water services, gas mains, gas services, telephone lines, cable

television lines, oil lines, etc. to ascertain the clearance between the utilities and the pipe to be burst and to ensure the pipe bursting will not adversely affect the existing utilities. Potholing is required and will not be paid for separately unless otherwise specified in the Proposal.

PART 2 PRODUCTS

2.01 HDPE WATER MAIN PIPE SYSTEMS

A. See 33 11 00 Water Utility Distribution Piping for open cut pipe installation application.

B. Pipe: AWWA C906, DR 11 (Pressure Class 200), Ductile Iron Pipe size. All HDPE materials must be listed and approved for use with potable water under ANSI/NSF standard 14. The exterior wall print line of all HDPE pipe must bear the AWWA C906 and the “NSF-pw” identification.

C. Material: PE 4710

D. Cell Classification: 445474C per ASTM D3350

E. Fittings:

1. Ductile Iron Fittings (where shown on the plans) shall be mechanical joint, ductile iron compact fittings conforming to AWWA C153/A21.53, with rubber gasket joints conforming to AWWA C111/A21.11, with double thickness cement mortal lining and coal tar epoxy coating on the outside of the fittings. Joining ductile iron fittings to HDPE pipe shall use fused Mechanical Joint Adapters with Ductile Iron Backup rings.

F. Pipe Joints: Butt Fusion Welded or Electrofusion Welded.

G. Valves and Hydrants:

1. As specified in Section 33 14 00 - Water Utility Distribution Piping.

2. Hydrant leads from the hydrant tee to the hydrant shall be Ductile Iron Pipe, AWWA C151/A21.51, Class 54, with polyethylene encasement, unless indicated otherwise on the plans. Fittings for joining Ductile Iron pipe to the hydrant tee or to gate valves shall be Mechanical Joint Adapters with Ductile Iron Backup rings.

H. Water Service Taps:

1. Electrofusion corporation saddles with 1-inch AWWA standard threads and brass corporation stops.

I. Allowable Leakage: Pipe shall be tested at 150 psi for 1 hour per ASTM F2164. Leakage allowance for fused HDPE pipe joints is zero. The leakage allowance per joint for gasketed fittings (based upon 150 psi test pressure) is as follows:

Size	6"	8"	10"	12"	14"
Gal / Hr	0.010	0.013	0.017	0.020	0.023

2.02 FUSION JOINTS

A. Unless otherwise specified, HDPE pipe lengths shall be assembled in the field with butt-fused joints. Contractor shall follow the pipe supplier’s written instructions for this procedure.

B. Joint strength shall be equal to the pipe as demonstrated by testing requirements. All fusion joints shall be completed as described in this specification.

2.03 TRACER WIRE

A. Reinforced 7 x 7 stranded copper clad steel wire with 50 mil High Density Polyethylene insulation. Continuous copper cladding metallurgically bonded to a steel core through a continuous solid cladding process. Bare wire 0.208-inch O.D., 4700 pounds breaking strength. Wire to be Copperhead® or equal.

2.04 CONNECTIONS AND FITTINGS

A. Connection Hardware:

1. Bolts and nuts for buried service shall be made of non-corrosive, high-strength, low-alloy steel having the characteristics specified in AWWA C111/A21.11, regardless of any other protective coating.

2.05 PIPE BURSTING SYSTEM EQUIPMENT

A. General:

1. Pipe bursting system shall be designed and manufactured to force its way through the existing line by fragmenting the pipe and compressing the broken pieces into the surrounding soil as its progresses. The bursting unit shall generate sufficient force to burst and compact the existing pipeline and allow for the insertion of the HDPE pipe.

B. Allowable Types of Pipe Bursting Systems:

1. Static Pipe Bursting Systems:

a. Static pipe bursting systems shall be characterized by a tapered or blunt nosed pull head being pulled through the host pipe and breaking the host pipe by applying radial pressure to the host pipe. The host pipe fails by ‘hoop’ tensile stress applied by the head and is fragmented and pushed into the surrounding bedding and soil as the pull head progresses.

b. Pull head shall be followed by an expansion head which shall further push the fragmented pipe into the surrounding soil and bedding to a diameter that allows the insertion of the HDPE pipe behind it. Under no circumstances shall the pipe pull head, which is attached directly to the HDPE pipe, be used to expand or otherwise increase the diameter of the host pipe, or fragmented host pipe.

c. Pull head may be advanced by a hydraulic or winching mechanism, and may be connected by means of a cable, chain, or rod.

2. Hydraulic Pipe Bursting Systems:

a. Hydraulic pipe bursting systems shall be characterized by a pull head that is equipped with hydraulically actuated ‘petals’ that break the host pipe by applying radial pressure to the host pipe. The host pipe fails by ‘hoop’ tensile stress applied by the head and is fragmented and pushed into the surrounding bedding and soil as the pull head progresses.

b. Pull head shall be followed by an expansion head which shall further push the fragmented pipe into the surrounding soil and bedding to a diameter that allows the insertion of the HDPE pipe behind it. Under no circumstances shall the pipe pull head, which is attached directly to the HDPE pipe, be used to expand or otherwise increase the diameter of the host pipe, or fragmented host pipe.

c. Pull head may be advanced by a hydraulic or winching mechanism, and may be connected by means of a cable, chain, or rod.

C. Pneumatic or percussive bursting systems are not be allowed.

PART 3 EXECUTION

3.01 DELIVERY AND OFF-LOADING

A. Pipes shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced by the Contractor.

B. Each pipe shipment should be inspected prior to unloading to see if the load has shifted or otherwise been damaged. Damaged pipe shall be rejected by the Contractor and removed from the project site.

C. Contractor shall check each pipe shipment for quantity and proper pipe size, color and type.

D. Pipe shall be loaded, off-loaded, and otherwise handled in accordance with AWWA M23. Care shall be taken to ensure that pipe is not dropped or damaged. Any damaged pipe shall be rejected by the Contractor and removed from the project site.

3.02 JOINT FUSING

A. HDPE pipe will be handled in a safe and non-destructive manner before, during, and after the fusion process and in accordance with this specification and pipe supplier’s recommendations.

B. Each joint fusion shall be recorded and logged by an electronic monitoring device (data logger) affixed to the fusion machine. Joint fusion data shall be submitted to the Engineer in accordance with this specification.

C. Only appropriately sized, and outfitted fusion machines that have been approved by the pipe supplier shall be used for the fusion process. Fusion machines must incorporate the following properties, including the following elements:

1. Heat Plate: Heat plates shall be in good condition with no deep gouges or scratches within the pipe circle being fused. Plates shall be clean and free of any contamination. Heater controls shall properly function, and cord and plug shall be in good condition. The appropriately sized heat plate shall be capable of maintaining a uniform and consistent heat profile and temperature for the size of pipe being fused, per the pipe supplier’s recommendations.

2. Carriage: Carriage shall travel smoothly with no binding at less than 50 psi. Jaws shall be in good condition with proper inserts for the pipe size being fused. Insert pins shall be installed with no interference to carriage travel.

3. General Machine: Overview of machine body shall yield no obvious defects, missing parts, or potential safety issues during fusion.

4. Datalogger: The current version of the pipe supplier's recommended and compatible software shall be used. Protective case shall be utilized for the handheld wireless portion of the unit. Datalogger operations and maintenance manual shall be with the unit at all times. If fusing for extended periods of time, an independent 110V power source shall be available to extend battery life.

D. Other equipment specifically required for the fusion process shall include the following:

1. Pipe rollers shall be used for support of pipe to either side of the machine

2. A weather protection canopy that allows full machine motion of the heat plate, fusion assembly and carriage shall be provided for fusion in inclement and /or windy weather.

3. Fusion machine operations and maintenance manual shall be kept with the fusion machine at all times.

4. Facing blades specifically designed for cutting HDPE pipe.

E. Joint Recording:

1. Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine. The fusion data logging and joint report shall be generated by software developed specifically for the butt-fusion of thermoplastic pipe. The software shall register and/or record the parameters required by the manufacturer and these specifications. Data not logged by the data logger shall be logged manually and be included in the Fusion Technician's joint report.

3.03 VERIFICATION

A. Grades, Lines, and Levels:

1. Prior to performing any pipe bursting operations, verify the grades, lines and levels to which the new Work is to be installed. Any Work required to adjust grades, lines and levels after Work has started will be at the expense of the Contractor performing the Work.

B. Potholing - Verifying Existing Structures and Utilities:

1. Prior to beginning any pipe bursting Work, contact the local one call system for locating buried utilities. Also contact the local municipalities, who may not be part of the one call system, to mark their buried facilities.

2. Excavate or pothole to verify in the field the location and elevation of existing active utilities and structures scheduled to remain and requiring protection from damage because of the Work. Existing utilities shall include, but is not limited to, gas mains and services, water mains and services, sanitary sewers and house leads, oil lines, telephone lines and services, cable television lines and services, electric lines and services, and any other similar buried utilities.

a. Where the vertical separation between the water main and the existing utility is less than 18-inches, excavate and lower the water main to maintain 18-inches of separation.

3. Determine amount of “humping” expected due to existing soil conditions and size of pipe burst. Notify the Engineer where existing utilities may be adversely affected due to the progress or performance of the Work.

4. Contractor is responsible for any excavation or potholing necessary to determine the elevation of existing utilities that cross the proposed water main at no additional cost to the Project unless otherwise indicated in the Proposal. Where necessary to relieve transient loading and prevent damage to existing utilities during the bursting operation, existing utilities shall be excavated.

5. Valves and fittings shall be excavated and removed as necessary to complete the Work. Concrete encasements and thrust blocks shall be excavated and broken out prior to beginning the Work.

3.04 EXCAVATION AND ACCESS PITS

A. Pit length shall be such that the minimum bending radius for the HDPE pipe, per the pipe supplier is maintained. Sheeting, shoring and bracing requirements shall be in accordance with these Section 31 23 16 - Structural Excavation and Backfill.

B. Pit excavations shall be performed at all points where the HDPE pipe will be inserted into the existing pipeline. When possible, access pit excavations shall coincide with host pipe lateral connection points, valves, hydrants or other appurtenance installations.

C. The pits shall be located such that their number shall be minimized, the footage of the new pipe installed in a single pull shall be maximized, and access to all properties shall be maintained.

D. Work is to be completed within existing street rights-of-way or utility easements. Open excavations shall be kept secure at all times with appropriate lights, signs, barricades, construction tape, etc.

E. Pipe shall be supported on rollers or other approved friction decreasing implement during joining and insertion to ensure pipe is not over-stressed or critically abraded prior to, or during installation.

3.05 TESTING

A. Hydrostatic Testing:

1. The pipe shall be hydrostatically tested for leakage after the pipe has been jointed on the surface and before the pipe has been installed in the burst hole. The Contractor shall furnish the pump, pipe, connections, hydrants, fittings, valves and any other necessary apparatus including gages and meters and all personnel necessary for conducting the test.

2. Before applying the test pressure, all air shall be expelled from the pipe. If necessary to accomplish this, taps shall be made at points of higher elevation and afterwards plugged.

3. Allow the test section to equalize to a common temperature and pressure. Gradually increase pressure to required test pressure.

4. HDPE pipe shall be held at the test pressure for 4 hours prior to beginning the test to allow for stabilization of expansion of the pipe under test pressure.

5. The full pressure shall be held for 1 hour.
6. Any faulty pipe fitting, valves or other accessories which permit leaks during testing shall be replaced by the Contractor with sound material and the test shall be repeated until specified requirements are met.
7. If no visual leakage is observed, and pressure during the test phase remains steady (within 5 % of the test phase pressure) for the entire test period, a passing test is indicated.
8. The maximum permissible leakage measured by water meter from the section of main tested under pressure, shall not exceed the rate as specified in Part 2 of this Section.
9. If retesting is necessary, depressurize the test section and correct any faults or leaks in the test section.
10. Test sections will normally not exceed 2,000 feet and in the event more than 2,000 feet of water main is tested, the permissible leakage will remain at the amount determined for 2,000 feet of pipe.
11. Water for testing shall be obtained from a potable water supply. The Contractor shall provide all water required at his own expense and shall make all necessary arrangements with the authority which controls the source of water system and shall be governed in his use of water by all rules and regulations imposed thereon by said authority.
12. Contractor shall provide and remove temporary connections between the source water system and the mains constructed under this Contract. All temporary connections shall meet the approval of the Engineer, the authority controlling the source water system and Public Health authorities having jurisdiction.

B. Disinfection:

1. The pipe for pipe bursting shall be disinfected twice, once prior to installation and once after installation. Before installation and after pressure testing the pipe shall be disinfected per the requirements of AWWA C651. After installation, the pipe shall be re-chlorinated using a slug method. Disinfection with solutions containing chlorine shall not contain more than 12.5% active chlorine.
2. Contractor shall initially disinfect the water main after satisfactory hydrostatic testing and flushing of the new water main. Disinfect the complete piping system in accordance with AWWA C651 by introduction of a chlorine-water solution throughout the water main piping. The liquid mixture shall be applied by means of a solution-feed chlorinating device.
3. Contractor shall install corporation stop and feed chlorine solution through the corporation stop at the beginning of the main or valved section. A slow flow of water shall be let into the main approximately at the point of injection of the chlorine solution, at a rate such that the chlorine dosage of the entering water shall be at least 25 parts per million.
4. An open discharge shall be maintained at the far end of the section of main being chlorinated, and the introduction of chlorine solution and water shall continue until the water discharging at the far end shall carry the required dosage of chlorine.
5. As the main is filled with chlorinated water, each outlet from the main shall be opened and sufficient water drawn off to assure that the full dosage of chlorine reaches each outlet.

6. Chlorine treated water shall remain in the main at least 24 hours, and at the end of that time the chlorine residual at pipe extremities and other representative points shall be at least 10 ppm. If the chlorine residual is less than 10 ppm at the end of 24 hours, further application of chlorine shall be made and the retention period repeated until the required 10 ppm residual is obtained.

7. Should the initial treatment of all or any section of the mains, in the opinion of the Engineer, prove ineffective, the chlorination procedure shall be repeated until confirmed tests show that water sampled from the new mains conforms to the foregoing requirements.

8. After installation, the pipe shall be disinfected by super-chlorinating the main with 300 mg/l of chlorine solution for 15 minutes. Back pressure causing a reversal of flow in the main being chlorinated shall be prevented, and pressure in the main shall be held down to a point which will make it impossible for chlorinated water to be forced into other sections of the main or water system.

9. After installation and chlorination by the super-chlorination, the water main will be flushed and another bacteriological sample will be drawn and analyzed in accordance with AWWA C651.

10. Contractor shall collect water samples and cause analyses to be made at his own expense. Testing laboratory and sample collection shall meet the approval of public health authorities having jurisdiction

C. Bacteriological Analysis:

1. Prior to placing a water main in service, not less than two (2) consecutive water samples taken 24 hours apart for bacteriological analysis shall be collected and each analysis shall show results meeting state and local drinking water standards.

2. The Contractor shall collect water samples and cause analyses to be made at his own expense. Samples shall be collected in accordance with AWWA C651. Testing laboratory and sample collection shall meet the approval of public agency having jurisdiction.

3.06 NOTIFICATION

A. Contractor shall notify the Owner and all water users affected by the work a minimum of seven days prior to beginning work. Notification shall be by means of a written notice on Owner letterhead, delivered to each user by the Contractor.

1. Notification shall advise user that the water system will be temporarily shut down and will advise user as to the date, time, length and duration water service will be interrupted.

2. The Contractor shall ensure that every user is so notified. Notification shall include telephone number(s) for contacting the Contractor at any time, day or night.

B. A second written notice to the water users affected shall be provided by Contractor one working day prior to the actual water service interruption. No water services are to be shut off for more than a period of 10 hours unless otherwise approved by the Engineer.

C. At the completion of the installation, a precautionary “Boil Water” advisory shall be issued to all water users. The “Boil Water” advisory shall be hand delivered by the Contractor to all water consumers on the line. The “Boil Water” advisory shall remain in effect until all pipe bursting in

the entire section is completed, and the last bacteriological sample is reported as “Non-detect” from a certified lab.

3.07 PROTECTION OF PRE-CHLORINATED PIPE

A. Maintaining sanitary conditions within the water main before and after pipe bursting must take high priority. The pipe ends shall be kept sealed at all times. Connections may not be made in standing water. Such water must be pumped or bailed prior to making the connection or unsealing the pipe. Areas under connections should be excavated below the pipe invert.

B. Before joining a surface and before any special surface preparation to accommodate that joining, external surfaces should be clean and dry. Dust may be removed by wiping with clean, lint free cloth. Heavier deposits must be washed from the surface with soap and water and dried with a clean, lint free cloth.

C. Incidental exposure of the interior of the pipe to any foreign matter shall require that one of the two following remedies be carried out:

1. Complete chlorination per AWWA C651 specifications for buried pipe.

2. Localized contamination at the end of the pipe may be removed and the contaminated interior surface of the pipe wiped with a solution of 1 to 5% hypochlorite disinfecting solution.

3.08 INSTALLATION

A. Concrete encasements shall be excavated and broken out prior to the bursting operation to allow the steady and free passage of the pipe bursting head.

B. HDPE pipe will be installed in a manner so as not to exceed the recommended bending radius.

C. Where HDPE pipe is installed by pulling in tension, the recommended Safe Pulling Force, according to the pipe supplier, will not be exceeded.

D. New HDPE pipe shall be inserted immediately behind the bursting head in accordance with the pipe supplier’s recommended procedures. The bursting equipment shall be specifically designed and manufactured for the type of insertion process being used.

E. It is the Contractor’s responsibility to determine safe and feasible upsizing parameters with the existing size of host pipe, and size of proposed pipe bursting pull-in pipe, and the existing conditions under which the pipe is being installed.

F. Pipe damaged or over-stressed by the Contractor during installation shall be removed and replaced at no additional cost to the Owner.

3.09 INSTALLATION ACCEPTANCE AND CLEANUP

A. The first six feet of HDPE pipe that is pulled into the receiving pit behind the pull head shall be inspected for damage. Depending on the gouging, abrading or damage, the pipe may be accepted, de-rated, reinstalled, or rejected by the Engineer.

B. Following the installation, the project site shall be returned to a condition equal to or better than the pre-construction condition of the site. All excavations will be backfilled and compacted per the drawings, these specifications, and jurisdictional standards. All pavement and hardscape

shall be repaired per applicable jurisdictional standards, excess materials shall be removed from the site, and disturbed areas shall be re-landscaped.

C. Evidence of surface upheaval shall require immediate remediation by the Contractor. Contractor shall also verify that all utilities, structures, and surface features in the project area are sound. Contractor shall repair any damage to the satisfaction of the Owner of the damaged facility.

3.10 INSTALLING FITTINGS FOR FIRE HYDRANTS, GATE VALVES, TEES, CROSSES, ETC.

A. Where required, fittings shall be cut into the new pipe after it is bored and allowed to relax sufficiently. The new pipe shall be excavated and precision cut.

1. Fused mechanical joint adapters and fully restrained mechanical joint fittings shall be used for all connections to PVC, Asbestos Cement or Ductile Iron water mains or appurtenances.

3.11 CONNECTION TO MAIN

A. Final connections of HDPE pipe to existing water mains shall be made after the new HDPE pipe has been allowed to relax for a minimum of 24 hours.

B. Connections of HDPE pipe to existing water mains shall consist of a full-circle Flex Restraint Collar fused to the HDPE pipe embedded in a 30” x 30” concrete thrust block poured to undisturbed earth placed a maximum of 5-feet from the connection point.

C. Prior to connection of the newly installed pipe, the section of pipe shall be fully flushed with the use of a de-chlorination unit and ascorbic acid to neutralize the residual chlorine. Following flushing, the newly installed section may be connected to the main at both ends and service reinstated.

D. After the new main is placed in service and before the boil water advisory is rescinded, only one of the isolating valves on either side of the new pipe should be open. This will allow the pipe to be placed in service while not allowing the water from the new pipe to enter other parts of the distribution system. The other valve may be opened once the water has been determined total coliform free.

3.12 SERVICE CONNECTIONS

A. Service connections on the existing water main that is to be burst or that are to be taken out of service due to this Project, shall be connected to the new main at the end of each day. No water services shall be out of service for more than 10 hours.

B. After the new HDPE pipe has been installed, the Contractor shall be responsible for reconnecting existing water services. Service leads shall be the size indicated in the plans and proposal. The service connections shall be tapped to the new main line with electro-fusion corporation saddles and brass corporation stops unless otherwise approved by the Engineer.

3.13 THRUST BLOCKS

A. Thrust blocks and thrust restrainers are required at all water main fittings.

END OF SECTION

SECTION 33 14 00 - WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes water main Work complete with water main piping, valves, hydrants, thrust blocks, valve wells, structures, fittings, joints, joint materials, nuts, bolts, glands, gaskets, plugs and accessories as shown and required. This Section also includes bedding and laying of water main piping, hydrostatic testing of new water main piping systems, flushing and chlorination of water main piping systems.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 33 00 - Submittal Procedures

C. Section 01 77 00 - Closeout Procedures

D. Section 31 23 16 - Structural Excavation and Backfill

E. Section 31 23 33 - Trenching and Backfilling

F. Section 31 34 10 - High Density Polyethylene (HDPE) Pipe and Fittings

1.03 REQUIREMENTS OF REGULATORY AGENCIES

A. Conform to the applicable requirements of State and local health authorities having jurisdiction for disinfection and testing of water mains.

B. Water main piping and appurtenances shall be NSF 61 certified. The certification should be stamped on the exterior wall of the pipe/appurtenance.

1.04 REFERENCE STANDARDS

A. Work shall conform to applicable provisions of the Contract Documents and to the latest edition of the following standards, except as modified in this Section:

1. ASTM A48/A48M - Standard Specification for Gray Iron Castings
2. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
3. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
4. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength
5. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
6. ASTM B88 - Standard Specification for Seamless Copper Water Tube
7. ASTM B98/B98M - Standard Specification for Copper-Silicon Alloy Rod, Bar and Shapes

8. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
9. ASTM B766 - Standard Specification for Electrodeposited Coatings of Cadmium
10. ASTM C55 - Standard Specification for Concrete Building Brick
11. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete
12. ASTM C139 - Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes
13. ASTM C150/C150M - Standard Specification for Portland Cement
14. ASTM C478/C478M - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
15. ASTM C595/C595M - Standard Specification for Blended Hydraulic Cements
16. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
17. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
18. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
19. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
20. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
21. AWWA C104/A21.4 - Cement–Mortar Lining for Ductile-Iron Pipe and Fittings
22. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
23. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems
24. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast
25. AWWA C153/A21.53 - Ductile-Iron Compact Fittings
26. AWWA C200 - Steel Water Pipe, 6 In. (150 mm) and Larger
27. AWWA C205 - Cement–Mortar Protective Lining and Coating for Steel Water Pipe—4 In. (100 mm) and Larger—Shop Applied
28. AWWA C207 - Steel Pipe Flanges for Waterworks Service, Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm)
29. AWWA C209 - Tape Coatings for Steel Water Pipe and Fittings
30. AWWA C210 - Liquid-Epoxy Coatings and Linings for Steel Water Pipe and Fittings
31. AWWA C214 - Machine-Applied Polyolefin Tape Coatings for Steel Water Pipe

32. AWWA C216 - Heat-Shrinkable Cross-Linked Polyolefin Coatings for Steel Water Pipe and Fittings
33. AWWA C218 - Liquid Coatings for Aboveground Steel Water Pipe and Fittings
34. AWWA C222 - Polyurethane Coatings and Linings for Steel Water Pipe and Fittings
35. AWWA C300 - Reinforced Concrete Pressure Pipe, Steel-Cylinder Type
36. AWWA C301 - Prestressed Concrete Pressure Pipe, Steel-Cylinder Type
37. AWWA C504 - Rubber-Seated Butterfly Valves
38. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances
39. AWWA C602 - Cement–Mortar Lining of Water Pipelines in Place-4 In. (100 mm) and Larger
40. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings
41. AWWA C651 - Disinfecting Water Mains
42. AWWA C800 - Underground Service Line Valves and Fittings
43. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm)
44. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 3⁄4 In. (19 mm) Through 3 In. (76 mm), for Water Service
45. AWWA C909: Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 In. (100 mm) and Larger
46. MDOT - Michigan Department of Transportation, Standard Specifications for Construction, latest edition
47. NSF 14 - Plastics Piping System Components and Related Materials
48. NSF 61 - Drinking Water System Components - Health Effects

1.05 SUBMITTALS

A. Tabulated Laying Schedule:

1. Where concrete water main pipe is used in the water main Work, a Tabulated Laying Schedule, showing stationing, deflection, elevation, slope and description of pieces shall be submitted to the Engineer. Pipe manufacture shall not be started until the laying schedule has been reviewed by the Engineer.

B. Product Data:

1. Submit catalog data showing pipe sizes, and manufacturing standards, as well as design calculations for internal pressure, vacuum and external load conditions, for both non-restrained and restrained joints.

C. Schedule of Corporation Stops (Tapping Outlets):

1. A complete schedule of all tapping outlets installed in concrete water main piping shall be kept by the Contractor and submitted to the Engineer at the end of each water main piping section of the Project or on the last day of each week, whichever occurs first.

D. Affidavits:

1. Submit manufacturer affidavit of compliance with the Contract Documents shall be submitted to the Engineer and shall include the following, where applicable:

a. Pipes, specials and fittings (AWWA C200)

b. Cement-mortar protective lining (AWWA C205 and AWWA C602).

c. Tape coating for the exterior (AWWA C214 and AWWA C209).

d. Shrink wrap for exterior (AWWA C216).

e. Paint system for the exterior (AWWA C210, C218 or C222).

f. Manufacturer's standard repair procedures.

g. Manufacturer's written quality control procedures.

h. Manufacturer's Installation Instructions: Indicate special installation requirements.

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

E. Restrained Joints:

1. Submit manufacturer’s data for restrained joint pipe and fittings for the Engineer’s review.

F. Testing Plan:

1. Submit a plan detailing flushing limits of pipe to be tested, bleed down points, proposed water source, and water disposal method and location. The plan should include proposed disinfection chemical and dechlornation method, as well as how the chemical will be introduced into the pipe and how the treated water will be dechlorinated prior to disposal.

1.06 CLOSEOUT PROCEDURES

A. The following shall be submitted in accordance with Section 01 77 00:

1. Manufacturer's field reports.

2. Project record documents:

a. Accurately record actual locations of piping mains, valves, connections, and invert elevations.

b. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

3. Provide a final record laying schedule.

4. Submit certified copies of hydrostatic test results of completed force main sections as specified in Part 3 of this specification.

1.07 DELIVERY OF MATERIALS

A. Provide two (2) percent of prestressed concrete pipe lengths to be delivered as short pieces with a length 10 feet or less. These short pieces shall be in addition to those required under the Tabulated Laying Schedule.

1.08 STORAGE OF MATERIALS

A. Pipe shall be stored in a manner to minimize infiltration of dirt, debris and other extraneous materials.

B. Piping materials shall not be stacked higher than 4 feet. Suitable racks, chairs and other supports shall be provided to protect preformed pipe mating surfaces from damage. Store bottom tiers off the ground, alternate tiers and chock tier ends.

C. Store hydrants, valves, wells and prefabricated structures off the ground, drained and kept free of water to protect against damage from freezing. Hydrants, valves, wells, their accessories and appurtenances shall be kept in their original containers until ready for installation.

D. Gaskets, glands, joint and sealing materials subject to ultra-violet or ozone attack shall be protected from the sunlight, atmosphere and weather; and stored in suitable enclosures until ready for installation.

1.09 HANDLING OF MATERIALS

A. Load and unload piping using suitably approved hoists and skidding. Piping shall not be dropped, bumped or allowed to impact against itself. Damaged piping shall be rejected by the Contractor.

B. Lifting devices shall be suited to the Work and shall protect surfaces from damage.

1.10 LEAD SERVICE LINE REPLACEMENT REQUIREMENTS

A. A water supply shall replace the entire lead service line. If the supply does not own the entire service line, the supply shall notify the owner of the line, or the owner's authorized agent, that the supply will replace the portion of the service line that it owns and the owner's portion of the line at the supply's expense. If the building owner does not consent, the supply shall not replace any portion of the service line, unless in conjunction with emergency repair. A water supply shall complete all of the following tasks:

1. Not less than 45 days before commencing the lead service line replacement, the water supply shall provide notice to the owner and residents of all buildings served by the line explaining that they may experience a temporary increase of lead levels in their drinking water, along with guidance on measures consumers can take to minimize their exposure to lead.

PART 2 PRODUCTS

2.01 GENERAL

A. It is the intent of the Articles in Part 2 of this specification section is to specify in detail the various types of pipe, joints, and fittings which have been indicated throughout the Plans and Specifications.

B. These Articles shall not be construed as allowing any alternate type of material to that which is indicated on the Plans or elsewhere in the Specifications.

2.02 DUCTILE IRON PIPE SYSTEM

A. Ductile Iron Pipe shall be AWWA C151/A21.51, with cement mortar lining inside, and 1-mil (25 µm) minimum thickness asphaltic coating outside. Pipe shall have a minimum wall thickness class for the pipe nominal inside diameter as indicated on the Plans or specified in the Proposal.

B. Mechanical joints for ductile iron pipe shall be compression gasket type, conforming to AWWA C111/A21.11 except that slots with the same width as the diameter of the bolt holes in mechanical joints shall not be allowed in the bell flange.

C. Push-on, compression gasket type joints shall conform to AWWA C111/A21.11 with spigot of pipe marked to visually determine when the spigot is fully seated in the bell of the adjoining section.

D. Fittings and plugs shall be ductile iron compact fittings, mechanical joint, pressure rating of 350 psi, conforming to AWWA C153/A21.53, and rubber gasket joints conforming to AWWA C111/A21.11, with double thickness cement mortar lining and coal tar enamel coating on the outside of fittings.

E. Flexible ball and retainer type joints shall be ball and retainer type, boltless, locking, and capable of being deflected up to 15 degrees.

F. Cement mortar linings for ductile iron pipe shall conform to the requirements of AWWA C104/A21.4 of the thickness specified and shall be permanently set prior to the application of any additional pipe coating.

2.03 PRESTRESSED CONCRETE PRESSURE PIPE SYSTEMS

A. Concrete piping shall be prestressed concrete, embedded cylinder type, 175 psi plus d-load design pressure conforming to AWWA C301. Seal coat in accordance with AWWA C104/A21.4 as applicable.

B. Joints for concrete pipe shall be push-on, steel ring, gasket type conforming to AWWA C300 or AWWA C301.

C. Fittings shall be AWWA C300, Type A, concrete or mortar lined with reinforced concrete or mortar exterior covering. AWWA C300, Type B, cut and welded steel plate, mortar coated on interior and exterior.

D. Seal coat concrete pipe with bitumastic concrete penetrant conforming to AWWA C104/A21.4. Apply after pipe has cured.

2.04 HIGH DENSITY POLY ETHYLINE (HDPE) PIPING SYSTEMS

A. See 33 05 09 Pipe Bursting Pre-Chlorinated HDPE Pipe for Water Main and 33 05 07 Utility Horizontal Directional Boring

2.05 RESTRAINED JOINTS

A. Where the Plans or Specifications call for restrained joints they shall be per the following.

1. Restrained joints for ductile iron pipe and fittings shall be designed for a working pressure of 350 psi. Joints shall be capable of being deflected after assembly. Restraints shall be by one of the following methods:

    a. A positive axial lock between the bell interior surface and a retainer welded on the spigot end of the pipe.

    b. A thrust restraint wedge which embeds in the pipe with twist off nuts to control wedge setting.

2. Restrained joints for PVC water main pipe shall be designed for a working pressure of 200 psi. Where the restrained portion of the pipe is connected to fittings, restraint shall be provided across the joint by a clamping ring and anchored to the fitting with T-head bolts or stainless-steel rods.

    a. Restraining devices for PVC water main pipe shall incorporate clamping rings with serrations on the inside surface to provide positive restraint on the outside surface of the pipe and shall provide full support around the circumference of the pipe to maintain roundness.

    b. Coating on wedge assemblies and related parts shall be two coats of heat cured liquid thermoset epoxy. Coating on casting bodies shall be electrostatically applied and heat cured polyester.

2.06 POLYETHYLENE ENCASEMENT

A. Polyethylene material for encasement shall be either 4 mil high density, cross-laminated polyethylene film or 8 mil linear low-density polyethylene film per AWWA C105/A21.5.

2.07 VALVES AND HYDRANTS

A. Butterfly Valves:

1. Butterfly valves shall be rubber-seated tight closing and shall conform to AWWA C504 latest revision.

2. Class 150 Valves (Non-Cyclic Applications)

3. Valves shall be of the flangeless wafer body style. All valves shall be suitable for use with ANSI 150-pound flanges. Bodies shall be cast iron. Valves shall be rated at 175 psi 75 psi. Bodies of all flangeless wafer valves shall have bolt guides to center the body in the pipeline.

4. Valves shall be furnished with self-lubricated bearings of TFE coated stainless steel. Shaft seals shall be provided to prevent leakage and to protect bearings from internal or external corrosion.

5. Valve seats shall be of the reinforced resilient type and shall be field replaceable. Seats shall also act as a body liner to prevent flow from contacting the body casting.

    a. Seats shall have flange sealing to provide a positive seal without use of flange gaskets.

    b. Seats shall be of Buna-N or EPDM suitable for use with potable water.

6. Shafts shall be one piece and shall be 316 stainless steel. Shaft diameter shall be suitable for the service conditions specified.

7. Shafts shall be finish ground to minimize bearing and shaft seal wear. Shafts on valves 12-inch and larger shall have a non-adjustable thrust collar.

    a. Shaft seals shall have a stuffing box and pull-down packing gland. Packing shall be furnished with self-adjusting “V” type packing.

8. Discs shall be aluminum bronze. The disc-to-shaft connections shall be Type 316 stainless steel.

9. Pins, shaft, and disc of all valves shall be individually machined and completely interchangeable.

10. Valves shall be available with field interchangeable manual or powered actuators as required. The actuator-to-shaft connection shall be designed to shear and prevent internal valve damage if the disc closes on foreign material in the pipeline.

11. Factory Testing: Test shall be conducted on each valve in accordance with Manufacturer’s Quality Control procedures.

12. Butterfly valves shall be marked with the valve size, manufacturer’s mark, year of manufacture, and class.

13. Manufacturer: Valves shall be DeZurik, Val-Matic, Clow or equal

B. Gate Valves:

1. Gate valves, sizes four inches through 16 inches, shall be East Jordan Iron Works, Flow Master Resilient Wedge type, conforming to AWWA C515 or approved equal. Valves shall be designed for 250 psi working pressure and 500 psi test pressure. Valve body shall be cast iron, with a smooth, unobstructed waterway. Valve body, bonnet, and thrust collar shall be coated inside and out with fusion bonded epoxy. Valves shall have a 2 inch square-operating nut with cast in directional arrow, and shall open clockwise. Gate valve shall have a cast bronze, non-rising stem with double “O” ring seals. Two low torque thrust bearings shall be located above and below the thrust collar to reduce friction and minimize operating torques. The stem nut shall be solid bronze and independent of the wedge. The wedge shall be cast iron, replaceable and completely encapsulated in permanently bonded urethane rubber per ASTM D429. Valve inlet and outlet connections shall be mechanical joint.

C. Fire Hydrants:

1. Hydrants shall be East Jordan Iron Works 5BR250 Traffic Model, dry barrel compression type conforming to AWWA C502 or approved equal. Unit shall have a seat valve and double operating stem “O” ring seals. Hydrant shall have a 5-1/4 inch diameter valve opening and 6 inch Mechanical Joint connection. Hydrant shall have one 4 inch diameter pumper nozzle with City of Detroit Fire Department standard threads; and one 5-inch, lock capable, Stortz pumper nozzle with solid cap. Stortz nozzle to be integral with the fire hydrant assembly, not an adapter. Hydrant shall have a 1-1/8-inch pentagon operating nut and be designed to open in a counterclockwise direction with an arrow cast into the top of the hydrant in a clearly visible location indicating the opening direction. The unit shall be

designed for 250 pound working pressure and 500 pound test pressure when tested in accordance with approved AWWA methods. Hydrants shall have nozzles on a removable head or upper section so nozzles may be rotated without removing the lower barrel section.

2. The bonnet, nozzle housing, lower barrel, and elbow must all be made of the same material (cast iron or ductile). The traffic safety device of the hydrant must consist of a two piece frangible section and a cast iron break coupling. The lower barrel must be flanged at both ends and have a reinforced traffic flange area. The lower barrel must also be designed to accept a one piece flanged spool extension at the traffic area of the hydrant.

3. The hydrant must be designed for removal of the stem, main valve, drain valve, and seat ring through the top of the hydrant without removing the nozzle housing. A short design wrench is required which does not place excessive force on the stem traffic coupling.

4. Hydrants shall be suitable for 5-feet 6-inch bury from bottom of hub to grade line unless otherwise indicated on the Plans. Hydrants' exterior surfaces shall be painted using suitably approved weatherproof paint. Hydrant shall be painted black below grade line and red above the grade line.

D. Air Release Valves:

1. Air Release valves shall have an ASTM A126 Class B cast iron body and cover with a threaded inlet connection of the size shown on the plans or listed in the schedule and a 1/2 inch NPT outlet connection.

2. Valve body shall have a 2 inch NPT plugged port near the base to facilitate cleanout of large solids as well as a 1/2 inch NPT connection near the top and 1 inch NPT port near the bottom to permit the installation of flushing attachments.

3. Valves shall have an 18-8 stainless steel float and a replaceable seat of Buna-N or other suitable material. Internal linkage mechanism shall be 18-8 stainless steel, plastic or bronze is not acceptable.

4. The linkage mechanism shall be capable of being removed from the cover without disassembly of the mechanism.

5. Valves shall have 3/16 inch diameter stainless steel orifice for working pressures up to 150 psi. Valve shall close drop tight.

6. The valve shall automatically exhaust accumulated air from a fluid system while the system is pressurized and operational.

7. For valves installed below grade, each valve shall be equipped with a flood safe kit to prevent inflow into the valve during submerged conditions.

2.08 TAPPING SLEEVES

A. Tapping Sleeves shall be cast iron or ductile iron, pressure rating of , mechanical joint sleeves conforming to AWWA C153/A21.53, furnished complete with valve, stops, caps, plugs and joint accessories as indicated on the Plan. The sleeve shall be of a 2-section type.

B. When approved by the Owner, tapping sleeves shall be 18-8 Type 304 stainless steel full circumference band, bolts, nuts and washers; rated for a working pressure of 250 psi. Gasket

shall be Buna-N. Flanges shall meet the requirements of AWWA C207, fusion bonded epoxy coated carbon steel.

2.09 VALVE BOXES

A. Valve boxes shall be 3-piece, 5-1/4 inch diameter, screw type, gray iron castings consisting of base section, bottom section, and top section with lid conforming to ASTM A48/A48M, Class 20. Overall length shall be adjustable to meet grade.

2.10 CORPORATION STOPS

A. Corporation stops shall be Ford F600-x, ball type corporation stops, 1-inch minimum size, AWWA taper thread inlet and Copper Flare outlet.

2.11 SERVICE SADDLES

A. Service saddles for HDPE pipe shall be Electrofusion corporation saddles with 1-inch AWWA taper thread outlet.

2.12 CURB STOPS AND CURB BOX

A. Curb stops shall be Minneapolis pattern, ball curb valve, Ford B22-xxxM, 1-inch minimum size, Copper Flare inlet and outlet.

B. Curb boxes in non-paved areas shall be Ford, Minneapolis pattern base, model EM2-65-xx, 1-1/2-inch inside diameter, 6-foot minimum extended length, with combination lid with pentagon plug.

2.13 THREADED FITTINGS

A. Where indicated on the Plans, threads for water main service fittings shall conform to the requirements of AWWA C800 and AWWA C800 "Appendix for Materials."

2.14 WATER SERVICE PIPE

A. Soft Copper shall be Type K conforming to ASTM B88, with flared fittings.

2.15 RESTRAINTS, CLAMPS, RODS, AND TIES

A. High strength low alloy steel or stainless-steel conforming to AWWA C111/A21.11. Balls and fittings shall be bronze alloy or corrosion protected steel.

2.16 STRUCTURES

A. Material for water main structures shall conform to the details on the plans and the requirements listed below:

1. Concrete brick shall be ASTM C55, Grade S-II, solid units of nominal 3 inch thickness.
2. Concrete block shall be ASTM C139 shape and scored as detailed and as approved.
3. Precast concrete structures shall conform to ASTM C478/C478M, circular with circular reinforcement as detailed. Provide lifting holes in precast units where indicated.

2.17 MANHOLE STEPS

A. Cast iron manhole steps shall be ASTM A48/A48M, Class 30, with a minimum cross section dimension of 1-inch (25 mm) in any direction.

B. Steel reinforced plastic manhole steps shall be 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.

C. Manhole steps shall be of types and sizes indicated on the Plans and shall comply with applicable state and federal occupational and safety standards.

2.18 COVERS AND FRAMES

A. Structure frame and covers shall be of the types and sizes as detailed on the Plans. Covers shall be ASTM A48/A48M, Class 30, gray iron castings. The castings shall be neatly made and free from cracks, cold sheets, holes and other defects. Surfaces of castings shall be ground to assure proper fit and to prevent rocking. Units shall be frost proof and shall be provided with tapping screws and anchors where indicated on the Plans.

2.19 BOLTS, STUDS, AND NUTS

A. Bolts, studs, and nuts shall be as specified on the Plans and shall conform to the requirements of AWWA C111/A21.11 and the ASTM standards listed below:

1. Bronze ASTM B98/B98M
2. Steel ASTM A307, Grade B
3. Cadmium Plating ASTM B766, Grade NS
4. Zinc Coating ASTM A153/A153M or ASTM B633, Type GS

B. Tee Head bolts and nuts shall be corrosion resistant, high-strength, low-alloy steel in accordance with ANSI/AWWA C111/A21.11 (Current Revision), a ceramic-filled, baked on fluorocarbon resin coating; Cor-Blue or Engineer approved equal.

2.20 CONCRETE

A. Concrete shall 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.

2.21 FLOWABLE FILL

A. Flowable Fill for filling abandoned Water Mains.

1. Materials:

a. Cement: Cement shall conform to ASTM C150/C150M or ASTM C595/C595M

b. Fly Ash: Fly ash shall have a maximum loss on ignition of 12 percent and meeting the other requirements of ASTM C618 (Class F)

c. The water shall meet the requirements of ASTM C94/C94M

2. Mixture Strength: (50 to 100 psi

    a. Fly ASh: 2,000 lbs/cyd minimum

    b. Cement: 100 lbs/cyd minimum

    c. Sufficient water to produce the desired flowability (approximately 700 lbs/cyd)

B. The temperature of the flowable fill mixture as manufactured and delivered shall be at least 50 degrees Fahrenheit.

C. The flowable fill can be mixed by pugmill, central concrete mixer, ready mix truck, turbine mixer, or other acceptable equipment or method.

D. Contractor shall submit a history of the mix design for seven (7) day and 28 day strengths, together with any other technical information. The design mix shall also be included as part of the Contractor's submittals for project.

2.22 TRACER WIRE

A. Copper clad steel wire with 30 mil High Density Polyethylene insulation. Concentric copper cladding metallurgically bonded to a steel core through a continuous solid cladding process. Copper cladding to measure 3% minimum of the overall wire diameter. Wire to be 12 AWG, 0.0808 inch diameter, 0.0024 inch nominal copper thickness, 9.5270 ohms nominal resistance per 1,000 feet, 675 pounds breaking strength. Wire to be Copperweld ® or equal.

2.23 ACCEPTABLE MANUFACTURERS

A. Flexible Joint Pipe:

1. Acceptable manufacturers include: "F141," Clow, "Usiflex," U.S. Pipe, or equal.

B. Restrained Joints:

1. Acceptable manufacturers for restrained joints for ductile iron pipe include: Griffin Pipe Products Company, "Snap-Lok" or "Bolt-Lok"; American Cast Iron Pipe Company, "Lok-Ring" or "Lok-Fast"; United States Pipe and Foundry Company, "TR Flex"; Ebaa Iron "Megalug" or Engineer approved equal.

2. Acceptable manufacturers for restrained joints for PVC pipe include: Ebaa Iron, "Megalug" or Engineer approved equal.

C. Valve Boxes:

1. Acceptable manufacturers include: "A-295 Three Piece Screw Type," Traverse City Iron Works; "F2450," Clow, "Series 6860, Tyler," or Engineer approved equal.

PART 3 EXECUTION

3.01 CONTRACTOR'S VERIFICATION

A. Prior to the installation of any water main piping or materials, examine all trenches and other excavations for the proper grades, lines, levels and clearances required to receive the new Work. Ascertain that all excavation bottoms, compacted subgrades and pipe bedding are adequate to receive water main materials to be installed. Correct all defects and deficiencies before proceeding with the work.

B. Expose the existing water main piping and structures to which the new Work is to be connected and notify the Engineer of the same. Engineer will verify the vertical and horizontal locations of the existing system and shall inform the Contractor as to the necessary adjustments required to align the new water main work with the existing system.

3.02 PREPARATION

A. Remove all lumps, blisters and excess coatings from the socket and plain ends of pipe. Wire brush and wipe clean the outside surfaces of all plain ends and the inside surfaces of all socket ends before installation. Any pipe or fitting which has acquired a coating of mud or other foreign material shall be scrubbed clean with heavily chlorinated water.

B. Pipe fittings, valves, hydrants, accessories and appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective or damaged materials shall be rejected and removed from the Project by the Contractor.

3.03 INSTALLATION - GENERAL

A. Foreign matter shall be prevented from entering the pipe while it is being placed in the trench. During and after laying operations, no debris, clothing or other materials shall be placed in the pipe.

B. During the progress of all water main Work, watertight plugs shall be carried along and inserted in the end of each pipe as it is laid to prevent foreign matter or rodents from entering the pipe. This watertight plug shall be fastened in the end of the water main in such a manner as to prevent it from floating or being otherwise displaced whenever construction operations are temporarily halted, such as at noon or at the end of the days Work.

C. Each section of pipe, when placed to grade and line, shall have firm bearing on the trench bedding throughout its length between bell holes.

D. Cutting of pipe shall be done with approved tools and by approved methods suitable for the pipe material. Pipe cutting methods that produce a smooth, square-cut end without damage to the pipe and that minimize airborne particles, shall be employed. Pipe cutting shall be performed using the recommendations of the manufacturer for the type of pipe materials being cut and according to the best trade practices.

E. When cutting pipe or fittings, care shall be taken to prevent damage to linings and coatings. Damage to linings shall be cause for rejection of the complete Section. Damage to exterior coatings shall be corrected to original Specifications.

F. Where pipe using a resilient gasket to effect the seal is cut, the cut pipe end shall be tapered at a 30-degree angle with the centerline of the pipe, and ground smooth, on the outside end to remove any sharp edges or burrs which might damage the gasket.

G. Unless otherwise specified, pipe shall be laid with bell ends facing in the direction of laying. After a length of pipe is placed in the trench, the spigot shall be centered in the bell end of the adjacent pipe section, the pipe shoved into position and brought to true alignment and secured with sand tamped under and on both sides of the pipe except at bell holes. Adequate support shall be provided for all water main pipe.

H. After the bottom of trench has been excavated the pipe bedding material will be installed in accordance with Section 31 23 33. The pipe shall then be installed strictly in accordance with

the manufacturer's recommendations. After the pipe is laid, the bedding shall be continued above the pipe as specified in Section 31 23 33. Particular care shall be taken to assure filling and tamping all spaces under, around and above the top of the pipe.

I. A continuous and uniform bedding as specified in Section 31 23 33 shall be provided in the trench for all buried pipe.

J. Backfill shall be as indicated on the Plans and as specified in Section 31 23 33.

K. Install bolts, studs, and nuts of the type specified per the manufacturer's installation and torquing requirements. Steel bolts, studs, and nuts shall be painted with bituminous paint after installation.

3.04 INSTALLATION OF DUCTILE IRON PIPE

A. Ductile iron water main shall be installed in accordance with the most current version of AWWA C600.

B. Push-on-joints shall be made by means of a compression type push-on resilient gasket. Gasket shall be prelubricated before installation using a lubricant recommended by the pipe manufacturer. Seated joint shall be identified by the visible mark on the spigot of the installed pipe section.

C. Mechanical joints shall be made with bolts, molded resilient gasket and cast iron follower gland. Nuts shall be screwed up finger tight before using a wrench. The gland and rubber gasket shall be brought up evenly at all points around the bell flange and then torqued per the manufacturer's recommendations.

D. Exposed portions of bolts shall be covered with mastic.

E. Flexible joint pipe shall be assembled, handled and installed in accordance with the printed recommendations which accompanies the pipe and is provided by the manufacturer of the piping materials being installed. Methods of handling and installation shall be acceptable to the Engineer.

3.05 INSTALLATION OF CONCRETE PIPE

A. Pipe and fittings shall be jointed by means of a resilient gasket and steel spigot ring. The resilient gasket shall be lubricated and installed to form a watertight joint between the bell and spigot of the pipe.

B. Pipe shall be laid in accordance with the accepted tabulated laying schedule and the Plans. Short lengths of pipe 10 feet as specified under part 1 of this Section shall be installed and evenly distributed along the line of the Work, if required.

C. The bell of the pipe in place shall be cleaned and properly lubricated and pipe section installed. After the spigot is well entered into the bell and the gasket is fully compressed and brought to final shape, prior to driving the pipe home, check each gasket for proper position around the full circumference of the joint and complete installation.

D. Provide cloth bands wired around each joint outside diameter and grout with Portland cement mortar grout. Completely fill the annular recess between the adjoining bell and spigot pipe ends. Annular spaces between pipe ends on the inside of joints of pipe 24 inches or more in diameter shall be filled with Portland cement mortar grout.

3.06 INSTALLATION OF HDPE PIPE

A. HDPE pipe shall be laid in complete accordance with the most current version of AWWA M55 and the pipe manufacturers published instructions.

3.07 INSTALLATION OF RESTRAINED JOINTS

A. Restrained joints shall be provided where indicated on the plans. Joints shall be assembled in strict accordance with manufacturer's directions. Joints shall be fully extended after assembly.

3.08 FITTINGS, STRAPPING, AND LUGGED PIPE

A. Install all fittings to the lines, levels and locations indicated on the Plans.

1. Thrust blocks shall be constructed as indicated on the plans or as required by the Engineer.

2. Fittings shall be provided with restraints as specified herein, as indicated on the Plans, or as required for a functional installation.

B. Where indicated on the Plans or as determined by the Engineer, bends in water main piping and piping runs subject to impact reaction shall be secured by means of metal strapping. Install all necessary bands, tie rods, nuts, and washers required. No metal strapping shall be used in direct contact with polyvinyl chloride pipe.

C. Where lugged pipe and special fittings are indicated on the Plans, furnish and install all necessary tie rods, nuts, and washers.

3.09 POLYETHYLENE ENCASEMENT

A. Where called for on the plans, ductile iron water main, fittings and hydrants shall be encased in a polyethylene film tube.

B. The polyethylene film tube shall be installed in accordance with AWWA C105/A21.5, Method A.

1. Method A consists of cutting the polyethylene tube two feet longer than the pipe to provide an overlap at the joints.

2. Service taps, bends, tees and other connections shall be made to polyethylene encased pipe in accordance with section 4.4.6 of AWWA C105/A21.5

C. Cost of the polyethylene encasement shall be incidental to the water main.

3.10 VALVES

A. Valves shall be installed to the grade, lines, levels and locations indicated on the Plans.

B. Valve connections shall be as specified for the piping materials used. Valves shall be set with the stem plumb on permanent, firm foundations as indicated on the Plans.

C. Where required, valves shall be supported with special supports as indicated on the Plans and as approved by the Engineer. Valves shall be installed so as not to receive support from the connecting pipe.

D. In no case shall valve installation be used to bring misaligned pipe into alignment.

3.11 WATER MAIN STRUCTURES

A. Construct water main valve wells and structures to the grades, lines and levels indicated on the Plans and as specified. Structures shall be complete with concrete bases, reinforcing, frames, covers, adjustment rings, etc. as shown and as required for a complete installation.

B. Construction of water main structures shall conform to the type of construction and dimensions indicated on the Plans and as described below.

1. Block Structures:

a. Construct concrete block structures in the locations and according to the details on the Plans. The first course of concrete blocks shall be placed on the prepared base or footings in a full bed of mortar.

b. Mortar joints shall be full and close in all courses. Joints shall be uniform in thickness throughout the structures. Strike all joints and properly point to provide true, smooth surfaces.

c. Courses shall be level throughout. Stagger joints in adjoining courses by one-half the length of the block as nearly as practicable.

2. Precast Concrete Structures

a. Construct precast concrete structures as detailed on the Plans. Provide mortar joints struck smooth.

b. Provide two (2) to four (4) courses of 8 inch brick at top of structure for future adjustment.

C. Cement mortar plaster coat shall be applied to the exterior surfaces of all brick or block gate wells and other water main structures indicated on the Plans. Plaster coat shall be 1/2 inch thick and shall be applied to the outer surfaces of the structures.

D. Provide and install to the elevations shown cast iron covers, frames, adjusting rings, anchors, etc., indicated on the Plans and as required. Castings shall be set in a full bed of cement mortar 1/2 inch thick minimum. Mortar joints shall be struck smooth.

E. Install steps for structures of types and in locations indicated on the Plans. Steps shall be installed on 16 inch centers, unless shown otherwise on the plans.

F. Pipe placed in structures for inlet or outlet connections shall extend through the walls and beyond the outside wall surfaces a sufficient distance to allow for complete connections. Openings between pipes and walls shall be sealed with a full bed of cement mortar. Pipe shall be supported by concrete supports.

3.12 VALVE BOXES

A. Install valve boxes to the grade, lines, levels and locations indicated on the Plans. Valve boxes shall not transmit shock or stress to the valve and shall be set plumb with covers centered over operating nuts and flush with the indicated surface elevations. Valve boxes that shift or fill during backfilling shall be uncovered and reset.

3.13 HYDRANTS

A. All hydrants shall be installed plumb to the lines, levels, grades and locations indicated on the Plans. Hydrants shall be set to the established grade, shall have their nozzles parallel to or at right angles to and facing the grade or curb.

B. Hydrant drain/weep holes shall be plugged.

C. Where necessary to adjust for proper hydrant location, the Contractor shall install additional pipe between the water main and road box. Hydrant and valve extensions shall be installed to adjust hydrant to proper grade.

D. Contractor shall plumb all hydrants at the time they are set with a plumb line or other means acceptable to the Engineer.

E. Upon substantial completion of cleanup, the Contractor shall recheck all hydrants for plumb and grade and shall make all adjustments as necessary at this time. The Work of constructing fire hydrants shall not be considered complete until these final adjustments for plumb and grade have been made.

3.14 FIRE HYDRANT APPROACHES

A. Fire hydrant approaches shall consist of culvert pipe with end protection and a gravel approach.

B. The culvert pipe shall be of the size and type shown on the Plans. The culvert pipe shall be installed to the existing or proposed grade of the drain or ditch with pipe bedding and backfill from a point below the pipe to a point 12 inches above the top of the pipe.

1. Pipe bedding shall consist of bank run sand meeting the requirements of MDOT Class II granular material and compacted to 95% of maximum unit weight.

C. Each end of the culvert pipe shall be protected against erosion, as shown on the Plans.

D. The gravel approach shall extend from the edge of the traveled portion of the road to the fire hydrant and shall be a minimum of 10 feet.

1. The gravel approach shall consist of a minimum of 6 inches of compacted MDOT 22A or 23A aggregate aggregate.

3.15 AIR RELEASE ASSEMBLY

A. Provide all materials and construct air release assemblies where indicated on the Plans. Install all valves, fittings, caps, plugs and piping as required. Fittings and joint materials used for air release assemblies shall be as specified herein for the water main piping materials used.

3.16 BLOW-OFF ASSEMBLY

A. Provide all materials and construct blow-off assemblies where indicated on the Plans. Blow-off assemblies and pipe shall be installed to the lines, levels and elevations shown.

B. Install all valves, fittings, reducers, piping, plugs, joints, etc., as detailed. Blow-off assemblies shall be installed on stable, undisturbed earth materials with changes in directions and returns

provided with bedding and restraints as indicated on the Plans, as specified herein and as required for a complete installation.

C. Blow-off assemblies shall include valve boxes as detailed.

3.17 TAPPING VALVE ASSEMBLY

A. Install all tapping valve assemblies of sizes and to the lines, elevations, locations and details indicated on the Plans.

B. The tapping sleeve shall be assembled around the main, and the tapping performed in strict accordance with the manufacturer's recommendations.

C. Tapping shall be accomplished without interruption of service.

3.18 ANCHORS, ENCASEMENTS, AND RESTRAINTS

A. Plugs, tees, sleeves, bends, caps, straps and lug piping shall be provided with suitable anchors, encasements and restraints as indicated on the Plans. Anchoring, encasement and restraint methods shall be as detailed. All bearings shall be as shown.

B. Anchors, encasements and restraints shall rest on firm, stable, compacted subgrade and shall be provided for all standard and special fittings.

3.19 WATER SERVICE LINES

A. When so indicated in the Proposal, or on the Plans, the Contractor shall provide water service lines in accordance with this Section. Otherwise, water service lines are not required.

B. Water service lines shall be installed after the water main has been successfully tested and put into service, including the installation of fire hydrants. The service lines shall be of the type indicated on the Plans and shall be a minimum of 3/4 inch or as otherwise indicated on the Plans or Proposal.

C. Water service lines shall be provided for all lots or parcels at the locations indicated on the Plans, within these Contract Documents or as designated by the Engineer. Service lines shall extend from the water main to within 1 foot of the limits of a right-of-way or easement at a minimum 5 foot depth terminating with a curb stop and curb box as specified herein.

D. Water service lines under concrete or asphalt pavements shall be installed by boring or tunneling, unless otherwise indicated on the Plans or approved by the Engineer.

E. Backfilling of open cut construction for water services shall be in accordance with Section 31 23 33, after the service line, including curb stop, has been laid and approved by the Engineer. Prior to backfilling the service line the Contractor shall request an inspection by the Engineer and obtain approval of the service line.

F. Alternative methods such as hydraulic jacking; air jetting; piston mole; etc, may be used to install water service lines if approved by the Engineer. The proposed method must be approved by the governmental agency having jurisdiction over the work area and the Contractor must demonstrate that, in the opinion of the Engineer, the method is suitable for local soil and ground conditions.

1. To be found suitable for local conditions, the method must be demonstrated to perform within acceptable horizontal and vertical accuracy limits, must not compress soil beyond acceptable limits, and must not leave voids in the soil.

2. Water jetting shall not be permitted.

3. Final installation of the service pipe must be in accordance with manufacturer's recommendations and no joints or fittings shall be allowed under roadway surfaces.

G. Existing water mains shall be kept in service until all water services have been connected to the new mains. Contractor shall repair all water services damaged during the installation of the new water mains. Only after the new mains have been tested and accepted and put into service, will service connections be made to the new mains.

H. Reconnection of Water Services

1. The connection of existing service lines to the new mains shall be made within the street rights-of-way or within the easements, utilizing the existing curb stops.

2. Existing lead water service lines shall be abandoned and new water service lines installed from the new water main to the water meter.

I. Backfill, method of construction under pavements, and new water service lines shall be as specified in this Section.

3.20 CORPORATION STOPS

A. Corporation stops shall be located on water main piping where indicated on the Plans, or as determined by the Engineer.

B. Install a minimum of two (2) corporation stops in each valve well.

C. One - 1 inch tapping outlets shall be installed at approximately 20 foot intervals along the entire length of the concrete water main.

1. These tapping outlets shall be constructed as detailed on the plans and shall be positioned 45 degrees off vertical.

2. The location of the tapping outlets shall be marked by means of No 4 reinforcing rod. The rod shall be placed in a vertical position immediately adjacent to, but not touching, the water main and the top, 6 inches below finished grade.

3.21 SERVICE SADDLES

A. Where service saddles are to be installed, the entire circumference of the main shall be free of all loose material. Installation of the saddle and tapping of the main shall be in accordance with manufacturer's recommendations.

3.22 CURB STOPS

A. Install curb stops of the types and sizes indicated on the Plans. Curb stops shall include furnishing and installing a curb box.

3.23 ABANDONING WATER MAIN

A. Install cap with a minimum 2 inch diameter threaded opening at one end of water main to be abandoned and solid cap at opposite end.

B. Install a minimum 2 inch diameter stand pipe no farther than from the end with the solid cap in the top of the water main to be abandoned. The stand pipe should be installed such that it can be removed after use and the hole sealed.

C. Install a minimum 2 inch diameter drain pipe in threaded opening. The drain pipe shall be installed in the opposite end of the water main from the stand pipe. The drain pipe should bend up to a 90 degree angle with the end of the pipe being a minimum of 6 inches above the top of the water main.

D. Using the stand pipe, fill the water main to be abandoned with flowable fill material. The material shall be placed in the water main until free water flows from the drain pipe at the opposite end.

E. Continue filling water main until the material released at the drain pipe is representative of the flowable fill being introduced at the fill end of the water main, at which time the drain pipe will be sealed with a threaded cap and the filling terminated.

F. Remove the stand pipe and cap the filling hole.

3.24 RELOCATE WATER MAIN

A. Relocate water main shall consist of removing and relaying and existing water main to avoid an existing or proposed utility. Existing pipe shall be removed and disposed of. Bends and vertical anchors shall be installed as shown on the plans. Verticals anchors and thrust blocks shall be sufficient to resist thrust forces.

3.25 ABANDON EXISTING GATE VALVE AND WELL

A. Gate valve and well and other water main structures on the existing water main shall be abandoned and the structures shall be abandoned in accordance with the following:

1. The abandonment of existing structures shall consist of removing and salvaging the existing frame and cover. The valve shall be opened. Masonry shall be broken down to an elevation at least 3 feet below the subgrade.

2. The abandoned structure shall be backfilled with flowable fill to 1 foot above the pipes and the remainder of the structure with sand-cement mixture at a 10 to 1 ratio to subgrade elevation or to 1 foot below finished grade.

3.26 REMOVE GATE VALVE AND WELL

A. Gate valve and well and other water main structures on the existing water main shall be removed in accordance with the following:

1. The removal of existing structures shall consist of removing and salvaging the existing frame and cover, and valve.

2. The ends of the existing water main shall be plugged and braced. The complete structure shall be removed entirely and disposed of.

3. The excavation shall be backfilled with sand and compacted to 95 percent of its maximum unit weight.

3.27 REMOVE EXISTING FIRE HYDRANTS

A. Fire hydrants on the existing water main shall be removed by excavating and removing the existing fire hydrant, gate valve, and valve box.

1. The existing hydrant lead shall be capped and blocked.

2. The fire hydrant, valve, and box shall be salvaged and delivered to a location as designated by the Owner.

3. The excavation shall be backfilled with sand and compacted to 95 percent of its maximum unit weight.

3.28 RELOCATION OF FIRE HYDRANTS

A. Relocation of hydrants shall include the provision of new hydrant shoes, frost jacket and restraints. Provide all new materials required for hydrant relocation.

1. Reinstall hydrants at the new locations to the lines and levels shown.

2. Make all joint connections to new or existing water mains, joints, couplings, etc., as shown and as required.

3. Provide all anchorage and restraint for a complete installation.

3.29 HYDROSTATIC TESTING

A. General:

1. After the pipe has been laid and backfilled, the pipe shall be hydrostatically tested for leakage.

2. A meeting shall be held by Engineer, Contractor, affected subcontractors and Owner prior to any testing of mains, valves, hydrants and appurtenances.

3. Contractor shall notify Engineer in writing at least 48 hours prior to hydrostatic testing of mains, valves, hydrants and appurtenances.

4. Contractor shall furnish the pump, pipe connection, hydrants, valves and any other necessary apparatus including gages and meters and all personnel necessary for conducting the test.

5. Before applying the test pressure, all air shall be expelled from the pipe. If necessary to accomplish this, taps shall be made at points of higher elevation and afterwards plugged.

6. Hydrostatic testing shall be witnessed and accepted by Engineer.

7. Test sections will normally not exceed 1 mile and in the event more than one 1 mile 1) mile (1.6 km) of water main is tested, the permissible leakage will remain at the amount determined for one (1) mile (1.6 km) of pipe.

8. Hydrostatic testing shall conform to AWWA C600.

B. Testing Ductile Iron Water Main

1. The test shall be made at a pressure of 150 psi gage minimum. The full pressure shall be held for at least two (2) hours.

2. Any faulty pipe fitting, gate valves or other accessories which permit leaks during testing shall be replaced by the Contractor with sound material and the test shall be repeated until specified requirements are met.

3. The maximum permissible leakage measured by water meter from the section of main tested under pressure, shall not exceed a rate of 10.49 U.S. gallons, per inch diameter of main, per mile of pipe, in 24 hours (1.079 liters, per millimeter diameter of main, per kilometer of pipe, per 24 hours) for each section tested.

3.30 FLUSHING

A. After completion of water main installation , flush the new mains, valves, hydrants and appurtenances completely in accordance with AWWA C651.

1. Flushing shall be completed prior to hydrostatic pressure testing and chlorination.

2. Contractor shall notify Engineer in writing at least 24 hours prior to flushing mains, valves, hydrants and appurtenances.

3. Flushing shall be witnessed and accepted by Engineer.

B. Heavily chlorinated water discharged from a disinfected system shall be controlled adequately to protect any surface water resource or adjacent property from potential environmental damage, or from creation of a hazard to traffic in accordance with AWWA C651.

C. Remove and dispose of all temporary installations at completion of the flushing operation.

D. After flushing, and prior to final approval of the system, the Contractor shall pump down all fire hydrants and verify that the hydrant valve is properly seated to prevent the hydrant standpipe from filling with water.

3.31 DISINFECTION

A. Contractor shall disinfect water main before making any connections to existing water mains. After satisfactory hydrostatic testing and flushing of the new water main, disinfect the complete system in accordance with AWWA C651 by introduction of a chlorine-water solution throughout the water main piping.

B. The liquid mixture shall be applied by means of a solution-feed chlorinating device. Contractor shall install corporation stop and feed chlorine solution through the corporation stop at the beginning of the main or valved section.

C. A slow flow of water shall be let into the main approximately at the point of injection of the chlorine solution, at a rate such that the chlorine dosage of the entering water shall be at least 25 parts per million (ppm). An open discharge shall be maintained at the far end of the section of main being chlorinated, and the introduction of chlorine solution and water shall continue until the water discharging at the far end shall carry the required dosage of chlorine.

D. As the main is filled with chlorinated water, each outlet from the main shall be opened and sufficient water drawn off to assure that the full dosage of chlorine reaches each outlet.

E. Back pressure causing a reversal of flow in the main being chlorinated shall be prevented, and pressure in the main shall be held down to a point which will make it impossible for chlorinated water to be forced into other sections of the main or water system.

F. The chlorine treated water shall remain in the main at least 24 hours, and at the end of that time the chlorine residual at pipe extremities and other representative points shall be at least 10 ppm. If the chlorine residual less than 10 ppm at the end of 24 hours, further application of chlorine shall be made and the retention period repeated until the required 10 ppm residual is obtained.

G. Should the initial treatment of all or any section of the mains, in the opinion of the Engineer, prove ineffective, the chlorination procedure shall be repeated until confirmed tests show that water sampled from the new mains conforms to the foregoing requirements.

H. Contractor shall collect water samples and cause analyses to be made at his own expense.

I. Testing laboratory and sample collection shall meet the approval of public health authorities having jurisdiction. Testing shall be performed by Michigan certified drinking water laboratories only.

3.32 WATER FOR CLEANING, TESTING AND DISINFECTION

A. Water for cleaning, testing and disinfection shall be obtained from a potable water supply.

B. Contractor shall provide all water required at his own expense and shall make all necessary arrangements with the authority which controls the source of water system and shall be governed in his use of water by all rules and regulations imposed thereon by said authority.

C. Contractor shall provide and remove temporary connections between the source water system and the mains constructed under this contract. Temporary connections shall meet the approval of the Engineer, the authority controlling the source water system, and Public Health authorities having jurisdiction.

3.33 BACTERIOLOGICAL ANALYSIS

A. Prior to placing a water main in service, not less than two (2) consecutive water samples taken 24 hours apart for bacteriological analysis shall be collected and each analysis shall show results meeting state and local drinking water standards.

B. Contractor shall collect water samples and cause analyses to be made at his own expense.

C. Samples shall be collected in accordance with AWWA C651.

D. Testing laboratory and sample collection shall meet the approval of public agency having jurisdiction.

3.34 CLEANING (PIGGING)

A. When required in the plans or specifications, all water main shall be mechanically cleaned. Cleaning shall be with a metal bodied, mandrel type solid plug (pig) with scrapers. The pig shall be pulled or otherwise propelled through the entire line prior to testing or connecting to any existing water main.

END OF SECTION

SECTION 33 34 10 - HIGH DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Contractor shall furnish labor, materials, equipment, and incidentals required to install High Density Polyethylene (HDPE) pressure pipe, fittings, and appurtenances as shown on the Drawings and specified in the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 33 00 - Submittal Procedures

B. Section 33 05 07 - Utility Horizontal Directional Boring

C. Section 33 14 00 - Water Utility Distribution Piping

D. Section 33 34 10.15 - Leakage Testing for HDPE Pipe

1.03 REFERENCE STANDARDS

A. Work shall conform to applicable provisions of the Contract Documents and to the latest edition of the following standards, except as modified in this Section:

1. AWWA C906 - Polyethylene (PE) Pressure Pipe and Fittings, 4 inch through 63 inch, for Water Distribution
2. AWWA M17 - Fire Hydrants: Installation, Field Testing, and Maintenance
3. AWWA M55 - PE Pipe Design and Installation
4. AWWA C651 - Disinfecting Water Mains
5. ASTM D2321 - ASTM D1248 - Standard Specifications for Polyethylene Plastics Molding and Extrusion Materials
6. ASTM D2774 - Standard Practice for Underground Installation of Thermoplastic Pressure Piping
7. ASTM D2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
8. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter
9. ASTM D3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
10. ASTM D3350 - Standard Specification for Polyethylene Plastic Pipe and Fittings Materials
11. ASTM E3261 - Standard Specification for Butt Heat Fusion Polyethylene Plastic Fittings for Polyethylene (PE) Plastic Pipe and Fittings Materials
12. ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter

13. ASTM F2164 - Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure
14. ASTM F2620 - Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings
15. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250
16. NSF/ANSI 14 - Certification of Plastic Piping Products
17. NSF 61 - Drinking Water System Components - Health Effects

1.04 SUBMITTALS

A. Detailed Plans and Shop Drawings:

1. Submittals shall be made in accordance with Section 01 33 00 and shall include:
    a. A list of materials to be furnished, the names of the suppliers, and the appropriate shop drawings for HDPE pipe and fittings;
    b. Pipe manufacturer's certification of compliance with the applicable sections of the Specifications; and
    c. Shop drawings showing installation method and the proposed method and specialized equipment to be used.
2. Permits and Inspection Records:
    a. Prior to beginning any horizontal directional drilling operations, submit copies of all permits and inspection records obtained from state and local authorities having jurisdiction.
3. Record Drawings:
    a. Submit as-built records, in duplicate, within five (5) days of Substantial Completion.
    b. As-built records shall include plan, profile, and information recorded during the progress of the Work, including subsurface anomalies.

1.05 QUALITY ASSURANCE

A. Qualification of Manufacturer:

1. HDPE pipe, fittings, and appurtenances shall be furnished by a single manufacturer who is fully experienced, reputable and qualified in the manufacture of the items to be furnished.
2. Manufacturer shall have manufacturing and quality control facilities capable of producing and assuring the quality of the pipe and fittings required by these Specifications.

B. Requirements of Regulatory Agencies:

1. Federal, State, and Local Regulations: Conform to the requirements of federal, state, and local regulatory agencies having jurisdiction.

1.06 DELIVERY, STORAGE AND HANDLING

A. The manufacturer shall package product in a manner designed to deliver the pipe and fittings to the project neatly, intact and without physical damage. During transportation each pipe shall rest on suitable pads, strips skids, or blocks securely wedged or tied in place.

B. During loading, transportation, and unloading, every precaution should be taken to prevent damage to the pipe. The handling of the pipeline shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Cuts or gouges that reduce the wall thickness by more than 10% are not acceptable and must be cut out and discarded.

C. Handle the pipe in accordance with the AWWA M55. Pipe and accessories shall be loaded and unloaded by lifting with hoists or by skidding in order to avoid shock or damage. Under no circumstances shall materials be dropped. Pipe handled on skidways shall not be rolled or skidded against pipe on the ground. Slings, hooks or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior surface or interior of the pipe. All pipe and fittings shall be subjected to visual inspection at time of delivery and before they are lowered into the trench to be laid.

D. Materials, if stored, shall be kept safe from damage and shall not be stacked higher than the limits recommended by the manufacturer. The bottom tiers shall be kept off the ground on timbers, rails, or concrete. Pipe shall not be stored close to heat sources. Contractor shall be responsible for security, damage and loss of pipe.

E. The interior of the pipe as well as all sealing surfaces of mating components (i.e. flange faces) shall be kept free from dirt or foreign matter at all times. The open ends of all sections of joined and/or installed pipe (not in service) shall be plugged to prevent insects, animals, or foreign material from entering the pipe line or pipe section. The practice of stuffing cloth or paper in the open ends of the pipe will not be permitted. Use waterproof nightcaps to prevent the entrance of any type of natural precipitation into the carrier or containment pipe and will be secured to the pipe in such a manner that the wind cannot blow them loose. Where possible, the pipe shall be raised and supported at a suitable distance from the open end such that the open end will be below the level of the pipe at the point of support.

1.07 PERMITS AND INSPECTIONS

1. Where applicable, obtain and pay for permits and inspections for horizontal directional drilling operations as required by PA 451, State of Michigan, 1994, and government and private agencies having jurisdiction.

2. No additional compensation shall be allowed because of the Contractor’s failure to obtain and pay for such permits and inspections.

3. Contractor shall be aware of, and conform to, Owner-obtained permits.

1.08 WARRANTY AND ACCEPTANCE

A. Warrant Work to be free from defects in workmanship and materials for a period of one year from the date of completion of construction. If Work meets these specifications, a letter of acceptance, subject to the one year warranty period, shall be given at the time of completion.

B. A final acceptance letter shall be given upon final inspection at the end of the one year warranty period, provided the work still complies with these specifications.

C. In the event deficiencies are discovered during the warranty period, they shall be corrected by the Contractor without additional charge to the Owner before final acceptance.

D. During the warranty period, the Engineer shall determine if warranty repairs or replacement work shall be performed by the Contractor.

PART 2 PRODUCTS

2.01 HIGH DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS

A. Fabrication:

1. Pipe and fittings shall be PE4710 high density polyethylene meeting cell classification of 345434E/C per ASTM D3350.

2. Pipe and fittings shall be manufactured in accordance with ASTM F714 or ASTM D3035. Piping shall bear markings indicating either SDR-PR or DR-PR.

3. Pipes and fittings shall be suitable for use as pressure conduits, listed as NSF 14 and NSF 61.

4. Pipe and fittings will have a nominal burst strength of three times the Working Pressure Rating or Pressure Class of the pipe per AWWA C906.

B. Pipe Identification:

1. The following shall be continuously indent printed on the pipe, or spaced at intervals not exceeding 5 feet:

a. Name and/or trademark of the pipe manufacturer

b. Nominal pipe size

c. Dimension ratio

d. The letters “PE” followed by the polyethylene grade in accordance with ASTM D1248 followed by the hydrostatic design basis in pounds per square inch (psi).

e. Service identification by co-extruding multiple equally spaced color stripes into the pipe outside surface or by solid colored pipe shell. Striping material shall be the same material as the pipe material except for color. The following colors shall be used to identify piping service:

1) Blue: Potable Water

2) Green: Wastewater or Force Main

3) Black: Raw Water

C. Fittings:

1. General:

a. Molded fittings and fabricated fittings shall be fully pressure rated to match the pipe SDR pressure rating to which they are made. Fittings shall be molded or fabricated by the manufacturer. Contractor-fabricated fittings shall not be permitted unless approved by the Engineer.

b. Manufacturer of the HDPE pipe shall supply HDPE fittings and accessories as well as any adapters and/or specials required to perform the work as shown on the Drawings and specified herein.

c. Fittings shall be installed using butt-fused fittings, thermo-fused fittings/couplings, or flanged adapters and must be approved by the Engineer.

d. Transition from HDPE pipe to ductile iron or PVC shall be made per the approval of the Engineer and per HDPE pipe manufacturer's recommendations and specifications.

e. A molded flange connector adapter within a carbon steel back-up ring assembly shall be used for pipe type transitions. Ductile iron back-up rings shall mate with cast iron flanges per ASME B16.1. A 316 stainless steel back-up ring shall mate with a 316 stainless steel flange per ASME B16.1.

1) Transition from HDPE to ductile iron fittings and valves shall be approved by the Engineer before installation.

2) No solid sleeves shall be allowed between such material transitions.

2. Polyethylene Fittings and Custom Fabrications:

a. Polyethylene fittings and custom fabrications shall be molded or fabricated by the pipe manufacturer.

b. Butt fusion outlets shall be made to the same outside diameter, wall thickness, and tolerances as the mating pipe.

c. Fittings and custom fabrications shall be fully rated for the same internal pressure as the mating pipe. Pressure de-rated fabricated fittings are prohibited.

3. Molded Fittings:

a. Molded fittings shall be manufactured in accordance with ASTM D3261 and shall be so marked.

b. Each production lot of molded fittings shall be subjected to the tests required under ASTM D3261.

4. Fabricated Fittings:

a. Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock, or molded fittings.

b. Fabricated fittings shall be rated for internal pressure service equivalent to the full service pressure rating of the mating pipe.

c. Directional fittings 16 inches IPS and larger such as elbows, tees, crosses, etc., shall have a plain end inlet for butt fusion and flanged directional outlets.

d. Part drawings shall be submitted for the approval of the Engineer.

5. Polyethylene Flange Adapters:

a. Flange adapters shall be made with sufficient through-bore length to be clamped in a butt fusion joining machine without the use of a stub-end holder.

b. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves to provide gasketless sealing, or to restrain the gasket against blow-out.

6. Back-up Rings and Flange Bolts:

a. Flange adapters shall be fitted with lap joint flanges pressure rated equal to or greater than the mating pipe.

b. Lap joint flange bore shall be chamfered or radiused to provide clearance to the flange adapter radius.

c. Flange bolts and nuts shall be Grade 2 or higher.

2.02 TRACER WIRE

A. Two strands of copper clad steel wire with 30 mil high density polyethylene insulation shall be installed.

B. Concentric copper cladding shall be metallurgically bonded to a steel core through a continuous solid cladding process.

C. Copper cladding to measure 3% minimum of the overall wire diameter.

D. Wire to be 12 AWG, 0.0808 inches in diameter, 0.00242 inches nominal copper thickness, 9.5270 ohms nominal resistance per 1,000 feet, 675 pounds breaking strength.

PART 3 EXECUTION

3.01 GENERAL

A. HDPE pipe and fittings shall be cut, joined, and installed in accordance with the manufacturer's recommendations. Joining, laying, and pulling of polyethylene pipe shall be accomplished by personnel experienced in working with polyethylene pipe systems.

3.02 PREPARATION

A. Layout of the Work:

1. Stake, mark, and layout the Work using suitable stakes and markers to facilitate verification of grades, lines, levels, and locations of the Work to be performed in a manner acceptable to the Engineer.

2. From reference points established by the Engineer on the surface of the ground, carry line and grade down to the bottom of any shafts or boring pits. Perform the Work to the line and grades established; protect such reference points throughout the progress of the Work.

B. Examination of Materials:

1. Prior to performing any installation Work, examine pipe for damage including but not limited to cracks, breaks, bends, dents, broken ends, or other damage which might affect the structural integrity, performance requirements, or jointing as shown on the Plans, specified herein, or as directed by the Engineer.

2. Defective pipe removed from the site and replaced with pipe at the expense of the Contractor.

3.03 HEAT FUSION JOINING

A. General:

1. Joints between plain end pipes and fittings shall be made by butt fusion, and joints between the main and saddle branch fittings shall be made using saddle fusion using only procedures that are recommended by the pipe and fitting manufacturer. External and internal beads shall not be removed.

B. Butt Fusion:

1. Pipe shall be joined by the butt fusion procedure outlined in ASTM F2620. A record or certificate of training for the fusion operator must be provided that documents training to the fundamentals of ASTM F2620.

2. Considerations should be given to and provisions made for adverse weather conditions, such as temperatures below freezing, precipitation, or wind, which is accepted by the Owner/Engineer.

3. Fusion Operators:

a. The employer of the fusion machine operator is responsible for the fusion joint quality of the fusion weld made by that individual. The employer is responsible for documenting all training and qualification records for that individual, including compliance to any code requirements for fusion/bonder operators.

b. HDPE fusion equipment operators shall be qualified to the procedure used to perform pipe joining. Fusion equipment operators shall have current, formal training on all fusion equipment employed on the project. Training received more than two years prior to operation with no evidence of activity within the past 6 months shall not be considered current.

c. For Projects with at least 5,000 feet or with pipe larger than 24 inches, operators or their supervisor must have a current McElroy Fusion Training Certificate for the equipment to be used on the project

4. Butt Fusion Equipment:

a. For pipe 6-inches and larger, the pipe butt fusion machine shall be a hydraulic fusion machine capable of butt fusing HDPE pipe. The carriage must be removable from the chassis for in-ditch use. The machine must be compatible with an electronic data recording device, McElroy DataLogger or equal.

b. Accessories will include all butt fusion inserts for the specified range of pipe sizes, a pyrometer kit for checking the surface temperature of the heater, extension cord of appropriate gauge (25' minimum), and hydraulic extension hoses (minimum of four).

c. The butt fusion machine will be McElroy, or approved equivalent.

3.04 MECHANICAL JOINING

A. General:

1. Polyethylene pipe and fittings may be joined together or to other materials by means of flanged connections (flange adapters and back-up rings) or mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material.
2. Mechanical couplings shall be fully pressure rated and fully thrust restrained such that when installed in accordance with manufacturer's recommendations, a longitudinal load applied to the mechanical cooling will cause the pipe to yield before the mechanical coupling disjoins.
3. External joint restraints shall not be used in lieu of fully restrained mechanical couplings.

B. Installation:

1. Mechanical joints and flange connections shall be installed in accordance with the Manufacturer's recommended procedure.
2. Flange faces shall be centered and aligned to each other before assembling and tightening bolts. In no case shall the flange bolts be used to draw the flanges into alignment.
3. Bolt threads shall be lubricated, and flat washers shall be fitted under the flange nuts. Bolts shall be evenly tightened according to the tightening pattern and torque step recommendations of the Manufacturer.
4. At least one hour after initial assembly, flange connections shall be retightened following the tightening pattern and torque step recommendations of the Manufacturer. Final tightening torque shall be 100 ft-lbs or less, as recommended by the Manufacturer.

3.05 BRANCH CONNECTIONS

A. Branch connections to the main shall be made with saddle fittings or tees. Polyethylene saddle fittings shall be saddle fused to the main pipe.

3.06 INSTALLATION

A. General:

1. HDPE pipe shall be installed by direct bury, directional bore, or a method approved by the Owner/Engineer prior to construction.
2. Installation shall be in accordance with Manufacturer's recommendations and this specification. Necessary precautions shall be taken to ensure a safe working environment in accordance with the applicable codes and standards.

B. Direct Bury:

1. Foundation and Bedding:

a. Pipe shall be laid on grade and on a stable foundation in accordance with Section 33 14 00, and/or Section 33 34 00.

2. Buried HDPE pipe and fittings shall be installed in accordance with ASTM D2321 or ASTM D2774 for pressure systems and AWWA Manual of Water Supply Practices M55 Chapter 8. The Design Window identified in AWWA M55 Chapter 5 (page 65 of 2006 version) shall be considered acceptable design and installation conditions.

3. Unless required by the owner's engineer, no thrust blocks shall be placed in the HDPE pipe system since the fused system is fully restrained.

C. Trenchless Installation:

1. See Section 33 05 07 - Utility Horizontal Directional Boring.

D. Appurtenances:

1. Appurtenances (tees, elbows, services, valves, air relief valves, fire hydrants, etc.), must be independently supported and shall not rely on the pipeline and its connections for this support. Excessive stresses may be encountered when appurtenances are inadequately supported.

2. Hydrant Assemblies shall be installed and field tested according to the requirements of AWWA M17.

3. Installation of Tracer Wire:

a. When tracer wire is required, Contractor will install along the entire section of pipeline per local and manufacturer's requirements.

b. Tracer wire shall be installed by Contractort once backfill has been placed and compacted to at least 12 inches above the top of the pipe and not more than 18 inches above the top of the pipe.

c. Tracer wire shall be properly spliced at each end connection and each service connection. Care should be taken to adequately wrap and protect wire at all splice locations. No bare tracer wire shall be accepted.

3.07 CLEANING, FLUSHING AND DISINFECTING

A. Cleaning and Flushing: Mains will be cleaned and flushed to remove dirt, sand, debris and foreign matter.

B. Disinfection:

1. Disinfecting of potable water systems shall be in accordance with AWWA C651 and AWWA AWWA M55.

2. Disinfection chemicals should be limited to less than 12% active chlorine. Chlorine tablets and powders are not permitted.

3. The duration of the disinfection should not exceed 24 hours.

4. Upon completion, the system should be thoroughly flushed with fresh water, and sampled to verify the disinfectant chlorine level has been reduced to potable drinking water concentrations in service water tubing and branch lateral pipes.

3.08 TESTING

A. Butt Fusion Testing:

1. On days when butt fusions are to be made, the first fusion of the day shall be a trial fusion.

a. The trial fusion shall be allowed to cool completely prior to cutting out test straps.

2. Tests strap shall be 12 inches (min) or 30 times the wall thickness in length with the fusion in the center, and 1 inch (min) or 1.5 times the wall thickness in width.

3. Test straps shall be bent until the ends of the strap touch. If the fusion fails at the joint, a new trial fusion shall be made, cooled completely, and tested.

    a. Butt fusion of pipe to be installed shall not commence until a trial fusion has passed the bent strap test.

4. Perform butt fusion joints in the presence of the Engineer or Engineer's representative. Record the temperature and corresponding time for each fusion joint.

B. Hydrostatic Pressure Testing:

1. HDPE pipes shall be pressure tested in accordance with Section 33 34 10.15 - Leakage Testing for HDPE Pipe.

END OF SECTION

SECTION 33 34 10.15 - LEAKAGE TESTING FOR HDPE PIPE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Work specified in this section consists of testing for signs of leakage in pipelines and structure to ensure they are watertight. Contractor shall furnish labor, equipment, air, water and other materials, including meters, gauges, smoke producers, blowers, pumps, compressors, fuel, bulkheads and accessory equipment for the complete and proper testing of specified utilities.

1. Test gravity sewers and drain lines by low pressure air testing.

2. Test all other pipelines with water under the specified pressures.

B. The section of the piping to be tested is isolated from other parts of the system and properly restrained in order to prevent failure of both the test section and the existing system connected to the test section. Isolated sections of the test section are vented to the atmosphere in order to ensure compressible gases do not remain within the hydraulic test section. The test section is filled with liquid, raised to the test pressure, and allowed to stabilize. The system is then inspected for leakage and the pressure is relieved. Any required repairs or replacements are then performed while the pipe is depressurized.

C. There is no leakage allowance, as properly made heat-fusion joints of HDPE do not leak. However, if any defects or leaks are revealed, they should be corrected and the pipeline retested after a minimum 24 hour recuperation period between tests. Total testing conducted on a section of pipeline shall not exceed eight hours within a 24 hour period.

D. An expansion allowance is allowed as HDPE will expand slightly due to elasticity and Poisson effects. The amount of make-up water (expansion allowance) will vary because expansion is not linear. This procedure compensates for expansion with an initial expansion phase followed by a testing phase as to which the test pressure is reduced suspending expansion. Expansion or contraction due to Poisson effects may disjoin other non-restrained joints, such as bell and spigot joints, so measures must be taken to fully restrain the test section.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 33 00 - Submittal Procedures

B. Section 33 14 00 - Water Utility Distribution Piping

1.03 SUBMITTALS

A. The following shall be submitted in accordance with Section 01 33 00:

1. Pre-Testing Report: Prior to placing the sewer system in service, Contractor shall submit to Engineer a detailed bound report summarizing the leakage test data, describing the test procedure and showing the calculations on which the leakage test data is based.

2. Post Resting Report: Following leakage testing, Contractor shall submit to Engineer a detailed bound report summarizing the leakage test data, including:

a. Length and diameter of section to tested (manhole to manhole);

b. Location of all service laterals and their status (active or inactive);

c. Type of plugs used and where;

d. Depth of pipe, and ground water pressure over pipe;

e. Stabilization time period and air pressure;

f. Actual air test pressures used if ground water is present;

g. The allowed time by specifications versus the actual test time;

3. The air pressure at beginning and end of test;

a. The name of the person performing the testing;

b. Date(s) and time(s) of testing, including any retesting; and,

c. Description of any repairs made following testing.

1.04 REFERENCE STANDARDS

A. Work shall conform to applicable provisions of the Contract Documents and to the latest edition of the following standards, except as modified in this Section

1. ASTM F1417-11A - Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air

2. ASTM F2164-21 - Standard Practice for Field Leak Testing of Polyethylene (PE) and Crosslinked Polyethylene (PEX) Pressure Piping Systems Using Hydrostatic Pressure

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. New HDPE pipelines installed shall be tested for leakage. Tests to be performed shall be witnessed by the Engineer.

3.02 FLUSHING

A. Mains shall be flushed to remove sand and other foreign matter.

B. The velocity of the flushing water shall be at least 4 feet per second (fps).

C. Flushing shall be terminated at the direction of the Engineer.

D. Dispose of the flushing water without causing a nuisance or property damage.

E. Temporary flush out connections shall be installed on all dead end water mains at the locations shown on the Contract Drawings.

3.03 RESTRAIN AGAINST MOVEMENT

A. Before applying pressure, all piping and all components in the test section must be restrained. This means that if piping or parts move or separate during the test, it will not result in damage or injury. Never conduct leak tests on unrestrained piping.

1. Heat fusion joints must be properly cooled before testing.

2. Mechanical connections must be completely installed and tightened per manufacturer's instructions.

3. If backfill provides restraint, it must be properly placed and compacted. Joints and connections may be exposed for inspection.

4. End closures must be suitable for pressure service and pressure-rated for the test pressure.

5. Ensure that connections to test equipment are secure. Disconnect or isolate all low pressure filling lines and other parts that are not to be subjected to test pressure. Restrain, isolate or remove expansion joints before leak testing.

3.04 TEST SECTION

A. Testing may be conducted on the full system or in sections. Test section length is determined by the capacity of the testing equipment. Lower capacity pressurizing or filling equipment may not be capable of completing the test within permissible time limits. If so, use higher capacity test equipment or select a shorter test section.

B. Before applying test pressure, allow time for the test fluid and the test section to equalize to a common temperature.

3.05 TEST PRESSURE

A. For pressure piping systems that include polyethylene pipe or fittings:

1. The maximum permissible test pressure is measured at the lowest elevation in the test section.

2. The maximum permissible test pressure is the lower of (a) 150% of the system design operating pressure provided that all components in the test section are rated for the test pressure, or (b) the pressure rating of the lowest pressure rated component in the test section.

B. For leak testing purposes, the maximum allowable test pressure in polyethylene pipe is 150% of the pipe's design pressure rating for the application and the application service temperature.

C. Do not subject lower pressure rated, non-polyethylene parts or devices to pressures above their pressure rating. Lower pressure rated parts may be removed or isolated from the test section to avoid damage or failure. Vent isolated parts or equipment to atmosphere.

D. Thermoplastic pipes have reduced strength at elevated temperature. Test pressure must be reduced when the test section is at elevated temperature either from service conditions or from environmental conditions such as being warmed by the sun. Multiply the test pressure by the multiplier shown in the table below to determine the allowable elevated temperature test pressure.

3.06 TEST DURATION

A. When testing at pressures above system design pressure up to 150% of the system design pressure, the maximum test duration is eight (8) hours including time to pressurize, time for initial expansion, time at test pressure, and time to depressurize the test section.

1. If the test is not completed due to leakage, equipment failure, or for any other reason, depressurize the test section completely, and allow it to relax for at least eight (8) hours before pressurizing the test section again.

B. Testing at excessive pressure or for excessive time may damage the piping system.

C. When testing at system design pressure or less, test duration including time to pressurize, time for initial expansion, time at test pressure and time to depressurize should be limited to a practical time period given that the test section is not to be left unsupervised at any time during leak testing.

3.07 HYDROSTATIC LEAK TESTING

A. This hydrostatic leak test procedure consists of filling, an initial expansion phase, a test phase, and depressurizing. There are two alternatives for the test phase.

1. Filling:

a. Fill the restrained test section completely with test liquid; ensure that there is no air trapped in the test section. Failure with entrapped air can result in explosive release and result in death or serious bodily injury. Use equipment vents at high points to remove air.

2. Initial Expansion Phase:

a. Gradually pressurize the test section to test pressure, and maintain test pressure for three (3) hours. During the initial expansion phase, polyethylene pipe will expand slightly. Additional test liquid will be required to maintain pressure. It is not necessary to monitor the amount of water added during the initial expansion phase.

3. Test Phase - Alternate 1:

a. Immediately following the initial expansion phase, reduce test pressure by 10 psi, and stop adding test liquid.

b. If test pressure remains steady (within 5% of the target value) for one (1) hour, no leakage is indicated.

3.08 LOW PRESSURE AIR TESTING OF GRAVITY FLOW SYSTEMS

A. For gravity flow and low or intermittent pressure applications such as sewer and odor control, leak testing in accordance with ASTM F1417 is recommended.

3.09 OTHER LEAK TESTS

A. Low Pressure Air Testing of Gravity Flow Systems:

1. For gravity flow and low or intermittent pressure applications such as sewer and odor control, leak testing in accordance with ASTM F1417-11A is recommended.

B. Initial Service Leak Testing:

1. An initial service leak test may be acceptable when other types of tests are not practical, or when leak tightness can be demonstrated by normal service, or when an opportunity is afforded by performing initial service tests of other equipment. An initial service leak test

may apply to systems where isolation or temporary closures are impractical, or where checking out pumps and other equipment allows the system to be examined for leakage prior to full-scale operations.

2. The piping system should be gradually brought up to normal operating pressure, and held at normal operating pressure for at least ten (10) minutes. During this time, joints and connections may be examined for leakage.

C. At the conclusion of the test, depressurize the test section by the controlled release of fluid from the test section. Controlled release avoids the potential for pressure surge.

END OF SECTION