

Project Specifications

Gerald R. Ford International Airport Authority
Kent County, Michigan

Natural Treatment System Improvements, Phase 1

March 10, 2026

C-437 (2250383)

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Advertisement

Owner: Gerald R. Ford International Airport Authority

Project Title: Natural Treatment System Improvements, Phase 1

Project #: C-437 (2250383)

1. RECEIPT OF BIDS

Sealed bids for the above project will be received by Gerald R. Ford International Airport Authority of 5500 44th Street SE, Grand Rapids, Michigan, 49512 until:

2:00 pm (local time) on Tuesday, April 14, 2026

at which time the bids will be publicly opened and read aloud.

2. PRE-BID MEETING

A bidders information meeting will be held at the Gerald R. Ford International Airport passenger terminal, International Room B, 5500 44th Street SE, Grand Rapids, MI, 49512 on March 31, 2026 at 11:00 am. Attendance at the bidders information meeting is **optional** for all General Contractors wishing to submit a bid on the project. Minutes of the bidders information meeting will be forwarded to all plan holders as an addendum.

3. SCOPE OF PROJECT

The project consists of furnishing all material and constructing the following:

Removal of existing treatment bed media and piping, disposal of bed material on airport property, construction of new bed media, piping and outlet controls

Including all necessary appurtenances and restoration.

4. EXAMINATION OF SPECIFICATIONS

Contract documents may be examined online at www.preinnewhof.com/plan-room or at the offices of:

Gerald R. Ford International Airport Authority, 5500 44th Street SE, Grand Rapids, Michigan, 49512

Prein&Newhof, 3355 Evergreen Drive NE, Grand Rapids, MI 49525

And some local plan rooms.

5. DEPOSIT FOR DRAWINGS AND SPECIFICATIONS

Drawings and specifications are available online at www.preinnewhof.com/plan-room or at the 3355 Evergreen Drive NE, Grand Rapids, MI 49525 office of Prein&Newhof after 10:00

am, Tuesday, March 17, 2026. Electronic drawings, specifications and bidding documents will be accessible/available only to those Bidders who are active members of the Prein&Newhof Plan Room. Bidder assumes sole risk for any project specifications and drawings, electronic or hard copy, obtained other than directly from Prein&Newhof. Hard copy drawings and specifications are available for the fee of \$180.00 dollars. Prein&Newhof Plan Room members who want to purchase the hard copy of the drawings only, may do so for \$78.00 dollars. A \$15 dollar charge will be added to all mailed drawings and/or specifications. Fees are payable by cash or check only and are not refunded.

6. FUNDING

The work to be performed under this contract will be financed and paid for by funds received from local sources.

7. BID SURETY

A bid bond, certified check, or cashier's check payable to 5500 44th Street SE, Grand Rapids, Michigan, 49512 in an amount equal to five percent (5%) of the total price shall accompany each bid. This surety shall bind the bidder for a period of sixty (60) days after the receipt of bids.

8. COMPLETION DATE

The project shall be completed on or before September 1, 2026.

A.J. Nye, Procurement Specialist
Gerald R. Ford International
Airport Authority
Kent County, Michigan

Instructions To Bidders

Owner: Gerald R. Ford International Airport Authority, Kent County, Michigan

Project Title: Natural Treatment System Improvements, Phase 1

Project #: C-437 (2250383)

1. CONTRACT DOCUMENTS

The contract documents consist of material outlined in Article 7 of the Agreement. Each Bidder shall carefully examine his copy of the contract documents for completeness. No claim will be allowed on the basis that the contract documents are not complete.

2. INTERPRETATION OF THE CONTRACT DOCUMENTS

It is the intent of these contract documents to be clear, complete and consistent. If Bidder is of the opinion that any portion of the contract documents is ambiguous, inconsistent or contains errors or omissions Bidder shall, prior to submitting its bid, in writing request Engineer to clarify that portion of the contract documents as an addendum. This interpretation or correction will be made a part of the contract documents as an addendum. Any such addendum shall be mailed, faxed, e-mailed or delivered only to each person recorded as having received/downloaded a copy of the contract documents directly from Prein&Newhof.

The last day an addendum will be issued is three (3) business days prior to the bid. Questions to be addressed in the addendum will be received through 5:00 p.m. five (5) business days prior to the bid.

Only written addenda issued by the Engineer shall be binding. Oral interpretations, information or instructions by any office or employee of the Owner or Engineer are not authorized and therefore are not binding.

Any conclusions or information obtained or derived from Contract Documents will be at the user's sole risk. Prein&Newhof will maintain the Master Copy (hard copy), from which all electronic copies are based in its Grand Rapids Office. In the case of any contract discrepancy, the Master Copy (hard copy) shall be considered the controlling document.

3. BIDDERS INVESTIGATION

The Bidder will be responsible for inspecting the site of the proposed work to determine for himself all conditions under which he will be obligated to work. It is also expected that he will investigate and make his own determination concerning the available facilities for receiving, transporting, handling and storing construction equipment and materials, and concerning other local conditions that may affect his work.

4. BID PROPOSAL PREPARATION

A. Name, Address and Legal Status of Bidder

The name and legal status of the Bidder, Corporation, Partnership or an Individual, shall be stated in the Proposal. A corporation Bidder shall name the state in which its Articles of Incorporation are held, and must give the title of the official having authority, under the by-laws, to sign contracts. A partnership Bidder shall give the full names and addresses of all partners. An L.L.C. Bidder shall provide the full names and addresses of all members.

Anyone signing a proposal as an agent of another must submit, with his proposal, legal evidence of his authority to act as an authorized agent of the party.

The place of residence of each Bidder, or the office address in the case of a firm or company, with county and state, must be given after a signature.

B. Bid Surety

See ADVERTISEMENT “BID SURETY”

C. Proposal Form

The Bidder is to complete the Bid Proposal Documents that are included in the Project Specification book (online or hard copy), referring to the table of contents to identify the exact order of these documents. Regardless of how the bid documents are received, a hard copy (paper copy) of the Bid Proposal Documents must be submitted for bidding purposes. *No electronically-submitted Proposals will be accepted.* The Bid Proposal Documents include: Bid Proposal Checklist, Bid Proposal, and Bid Proposal – Unit Prices.

The Bidder must provide the signed Bid Proposal Documents in either type written or hand written (in ink) form and clearly and completely set forth all required lump sum amounts, unit prices or other costs in a legible and understandable manner. Illegibility of any work or figure in the proposal may be sufficient cause for rejection of the proposal by the Owners. *No electronically-submitted Proposals will be accepted.*

Each proposal must be enclosed in a sealed envelope addressed to 5500 44th Street SE, Grand Rapids, MI 49512 and labeled “Proposal for Gerald R. Ford International Airport Authority, Kent County, Michigan, Natural Treatment System Improvements, Phase 1.” No electronically submitted Proposals will be accepted.

D. Proposal Data

Proposals shall be carefully prepared in strict accordance with contract requirements and these instructions and shall include all pertinent information required by the proposal form. Failure of the bidder to comply in any respect shall be grounds for rejection of the bidder's proposal.

The proposal for work is on a unit basis.

The bids will be based on the comparison of totals of the extensions of the stated unit prices. In case of an error in preparation of the bid form, the unit prices will be used.

No partial bids will be considered.

E. Experience and Qualifications

It is the intention of the Owner to award this contract to a Bidder that will perform and complete all work in compliance with the Contract Documents and in a workmanlike and professional manner. Bids are therefore only solicited from responsible Bidders known to be skilled, experienced and regularly engaged in work of similar character and magnitude to that covered by these contract documents.

After the opening of bids, when so requested by the Owner or Engineer, the Bidder will be required to provide documentation of the extent and nature of his experience in work of this kind and to furnish references as to his experience on projects of similar types and concerning contractor's ability to timely and within budget perform work of the type involved in this project. The successful Bidder shall submit a statement of his experience and financial status, a list of all jobs he now has underway, with the volume and percent completed. If the successful Bidder is an LLC, bidder shall provide, if requested, personal guarantees of its members.

In addition to the above, when so requested, the Bidder shall meet with the Owner's representatives and give further information in relation to his proposed construction plan, methodology, and schedule of operations, in order to determine the Bidder's qualifications, ability to perform the Work, and timely complete the Work in accordance with the contract requirements.

F. Return of Bid Deposits

The bid deposits of all Bidders, except the three lowest Bidders, will be returned within seven days after the opening of the bids. The bid deposits of the three lowest Bidders will be returned (1) within 48 hours after the contract shall have been awarded to the successful Bidder, the signed agreement has been delivered, and the required bonds have been approved by the Owner, or (2) after rejection of all bids.

5. WITHDRAWAL OF BIDS

Any Bidder who has submitted a proposal to the Owner may withdraw his bid at any time prior to the scheduled time for opening bids. No Bidder may withdraw his bid after the opening for a period of Sixty (60) days thereafter.

6. AWARD AND EXECUTION OF THE CONTRACT

The contract shall be deemed as having been awarded when formal Notice of Award shall have been duly provided by the Owner upon the Bidder.

The Bidder to whom the contract shall have been awarded will be required to execute an Agreement in the form included in the Contract Documents and to furnish sureties, insurance policies and certificates all as required within fifteen (15) days after the award. In case of his refusal or failure to do so, he will be considered to have abandoned all his rights and interest in the award, and his bid deposit may be declared forfeited to the Owner and the work may be awarded to another Bidder.

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Bid Proposal Checklist

Owner: Gerald R. Ford International Airport Authority, Kent County, Michigan

Project Title: Natural Treatment System Improvements, Phase 1

Project #: C-437 (2250383)

This checklist is for the bidder's convenience and the Engineer's use. It should be reviewed thoroughly before submitting a bid.

- Bid submitted on time.
- Bid surety properly completed and enclosed.
- Addenda, if applicable, has been acknowledged and any revisions to the proposal completed.
- Bid proposal legally signed in ink.
- All unit prices are completed in ink.

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Bid Proposal - Unit Prices

Owner:

Gerald R. Ford International Airport Authority

Project Title:

Natural Treatment System Improvements, Phase 1

Bid Date & Time:

Project #:

C-437 (2250383)

Item No.	Description	Quantity	Unit	Unit Price	Total Amount
1	Mobilization, Max 10%	1	Lsum		
2	Safety and Security	1	Lsum		
3	Permits	2,500	DLR	\$1.00	\$2,500.00
4	Erosion Control, Check Dam, Stone	80	Ft		
5	Erosion Control, Inlet Protection, Fabric Drop	12	Ea		
6	Erosion Control, Sediment Basin	12	Cyd		
7	Erosion Control, Silt Fence	1,200	Ft		
8	Excavation, Earth, As Specified	1,500	Cyd		
9	Dr Structure Cover, Misc	1	Ea		
10	Dr Structure Cover, Adj, Case 2	2	Ea		
11	Dr Structure Cover, Adj, Add Depth	7	Ft		
12	Driveway, Nonreinf Conc, 6 Inch	720	Syd		
13	Fertilizer, Chemical Nutrient, Cl B	200	Lb		
14	Mulch	7,850	Syd		
15	Mulch Anchoring	7,850	Syd		
16	Mulch Blanket, High Velocity	7,850	Syd		
17	Seeding, Mixture, THV	350	Lb		
18	Topsoil Surface, Salv, 4 Inch	7,850	Syd		

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Item No.	Description	Quantity	Unit	Unit Price	Total Amount
19	Treatment Media	2,100	Cyd	_____	_____
20	Top-Dressing Media	550	Cyd	_____	_____
21	Course Media	80	Cyd	_____	_____
22	Geotextile Fabric	40,000	Sft	_____	_____
23	Gabion Basket	260	Lf	_____	_____
24	Gabion 3" to 6" Rock	60	Cyd	_____	_____
25	Splash Pad	8	Ea	_____	_____
26	Piping	250	Lf	_____	_____
27	R-Tanks Mini	650	Ea	_____	_____
28	R-Tanks HD Single	650	Ea	_____	_____
29	Media Removal	6,100	Cyd	_____	_____
30	Piping Removal	1,260	Lf	_____	_____
31	Infiltrator Removal	576	Ea	_____	_____
32	Smart Drain	2	Ea	_____	_____
				Total Bid:	_____

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AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

This Agreement is by and between Gerald R. Ford International Airport Authority (“Owner”) and _____ (“Contractor”).

Terms used in this Agreement have the meanings stated in the General Conditions and the Supplementary Conditions.

Owner and Contractor hereby agree as follows:

ARTICLE 1—WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: Natural Treatment System Improvements, Phase 1 including removal of existing treatment bed media and piping, disposal of bed material on airport property, construction of new bed media, piping and outlet controls.

ARTICLE 2—THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: Natural Treatment System Improvements, Phase 1

ARTICLE 3—ENGINEER

3.01 The Owner has retained Prein&Newhof, 3355 Evergreen Drive NE, Grand Rapids, MI 49525 (“Engineer”) to act as Owner’s representative, assume all duties and responsibilities of Engineer, and have the rights and authority assigned to Engineer in the Contract.

3.02 The part of the Project that pertains to the Work has been designed by Prein&Newhof.

ARTICLE 4—CONTRACT TIMES

4.01 *Time is of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 *Contract Times: Dates*

A. The Work will be substantially complete on or before **August 31, 2026**, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before **September 30, 2026**.

4.03 *Contract Times: Days*

A. ~~The Work will be substantially complete within [number] days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within [number] days after the date when the Contract Times commence to run.~~

4.04 Milestones

A. Parts of the Work must be substantially completed on or before the following Milestone(s):

1. ~~Milestone 1 [event & date/days]~~
2. ~~Milestone 2 [event & date/days]~~
3. ~~Milestone 3 [event & date/days]~~

4.05 Liquidated Damages

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the Contract Times, as duly modified. The parties also recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. *Substantial Completion:* Contractor shall pay Owner **\$2,500.00** for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion, until the Work is substantially complete.
2. *Completion of Remaining Work:* After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner **\$5,000.00** for each day that expires after such time until the Work is completed and ready for final payment.
3. ~~*Milestones:* Contractor shall pay Owner **[\$number*]** for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for achievement of Milestone 1, until Milestone 1 is achieved, or until the time specified for Substantial Completion is reached, at which time the rate indicated in Paragraph 4.05.A.1 will apply, rather than the Milestone rate.~~
4. Liquidated damages for failing to timely attain Milestones, Substantial Completion, and final completion are not additive, and will not be imposed concurrently.

B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.

C. *Bonus:* Contractor and Owner further recognize the Owner will realize financial and other benefits if the Work is completed prior to the time specified for Substantial Completion. Accordingly, Owner and Contractor agree that as a bonus for early completion, Owner shall pay Contractor **[\$number]** for each day prior to the time specified above for Substantial Completion (as duly adjusted pursuant to the Contract) that the Work is substantially complete. The maximum value of the bonus will be limited to **[\$number]**.

4.06 Special Damages

A. Contractor shall reimburse Owner (1) for any fines or penalties imposed on Owner as a direct result of the Contractor's failure to attain Substantial Completion according to the Contract

Times, and (2) for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Substantial Completion (as duly adjusted pursuant to the Contract), until the Work is substantially complete.

- B. After Contractor achieves Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times, Contractor shall reimburse Owner for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Work to be completed and ready for final payment (as duly adjusted pursuant to the Contract), until the Work is completed and ready for final payment.
- C. The special damages imposed in this paragraph are supplemental to any liquidated damages for delayed completion established in this Agreement.

ARTICLE 5—CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents, the amounts that follow, subject to adjustment under the Contract:

- A. ~~For all Work other than Unit Price Work, a lump sum of \$[number].~~
~~All specific cash allowances are included in the above price in accordance with Paragraph 13.02 of the General Conditions.~~
- B. ~~For all Unit Price Work, an amount equal to the sum of the extended prices (established for each separately identified item of Unit Price Work by multiplying the unit price times the actual quantity of that item).~~

Unit Price Work					
Item No.	Description	Unit	Estimated Quantity	Unit Price	Extended Price
				\$	\$
				\$	\$
				\$	\$
				\$	\$
				\$	\$
Total of all Extended Prices for Unit Price Work (subject to final adjustment based on actual quantities)					\$

~~The extended prices for Unit Price Work set forth as of the Effective Date of the Contract are based on estimated quantities. As provided in Paragraph 13.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Engineer.~~

- C. ~~Total of Lump Sum Amount and Unit Price Work (subject to final Unit Price adjustment) \$[number].~~
- D. For all Work, at the prices stated in Contractor’s Bid, attached hereto as an exhibit.

ARTICLE 6—PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

- A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

- A. Owner shall make progress payments on the basis of Contractor's Applications for Payment on or about the Thirtieth (30th) day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.
 - 1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract.
 - a. **90** percent of the value of the Work completed (with the balance being retainage).
 - 1) If 50 percent or more of the Work has been completed, as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage; and
 - b. **0** percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
 - B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to **98** percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less **100** percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

6.03 *Final Payment*

- A. Upon final completion and acceptance of the Work, Owner shall pay the remainder of the Contract Price in accordance with Paragraph 15.06 of the General Conditions.

6.04 *Consent of Surety*

- A. Owner will not make final payment, or return or release retainage at Substantial Completion or any other time, unless Contractor submits written consent of the surety to such payment, return, or release.

6.05 *Interest*

- A. All amounts not paid when due will bear interest at the rate of **0** percent per annum.

ARTICLE 7—CONTRACT DOCUMENTS

7.01 Contents

- A. The Contract Documents consist of all of the following:
1. This Agreement.
 2. Bonds:
 - a. Performance bond (together with power of attorney).
 - b. Payment bond (together with power of attorney).
 3. General Conditions.
 4. Supplementary Conditions.
 5. Specifications as listed in the table of contents of the project manual.
 6. Drawings (not attached but incorporated by reference) consisting of Thirteen (13) sheets with each sheet bearing the following general title: C-437 Natural Treatment System Improvements.
 7. Addenda (numbers **[number]** to **[number]**, inclusive).
 8. Exhibits to this Agreement (enumerated as follows):
 - a. **Contractor's Bid (pages 1 to 3, inclusive)**
 - b. Insurance Specifications (pages 1 to 13, inclusive).
 - c. The 2020 Standard Specifications for Construction adopted by the Michigan Department of Transportation are hereby incorporated into these contract documents.
 - d. [List other required attachments (if any), such as documents required by funding or lending agencies]
 9. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
 - a. Notice to Proceed.
 - b. Work Change Directives.
 - c. Change Orders.
 - d. Field Orders.
 - e. Warranty Bond, if any.
- B. The Contract Documents listed in Paragraph 7.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 7.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

ARTICLE 8—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.01 *Contractor's Representations*

- A. In order to induce Owner to enter into this Contract, Contractor makes the following representations:
1. Contractor has examined and carefully studied the Contract Documents, including Addenda.
 2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 3. Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
 4. Contractor has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
 5. Contractor has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
 6. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.
 7. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
 8. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
 9. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
 10. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

11. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

8.02 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 8.02:
 1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;
 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

8.03 *Standard General Conditions*

- A. Owner stipulates that if the General Conditions that are made a part of this Contract are EJCDC® C-700, Standard General Conditions for the Construction Contract (2018), published by the Engineers Joint Contract Documents Committee, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or "track changes" (redline/strikeout), or in the Supplementary Conditions.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on _____ (which is the Effective Date of the Contract).

Owner:

Gerald R. Ford International Airport Authority

(typed or printed name of organization)

By:

(individual's signature)

Date:

(date signed)

Name:

(typed or printed)

Title:

(typed or printed)

Attest:

(individual's signature)

Title:

(typed or printed)

Address for giving notices:

5500 44th Street SE

Grand Rapids, MI 49512

Designated Representative:

Name: A J Nye

(typed or printed)

Title: Procurement Specialist

(typed or printed)

Address:

5500 44th Street SE

Grand Rapids, MI 49512

Phone: (616) 233-6251

Email: anye@grr.org

(If [Type of Entity] is a corporation, attach evidence of authority to sign. If [Type of Entity] is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)

Contractor:

(typed or printed name of organization)

By:

(individual's signature)

Date:

(date signed)

Name:

(typed or printed)

Title:

(typed or printed)

(If [Type of Entity] is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest:

(individual's signature)

Title:

(typed or printed)

Address for giving notices:

Designated Representative:

Name:

(typed or printed)

Title:

(typed or printed)

Address:

Phone:

Email:

License No.:

_____ *(where applicable)*

State:

PERFORMANCE BOND

Contractor Name: Address <i>(principal place of business)</i> :	Surety Name: Address <i>(principal place of business)</i> :
Owner Name: Gerald R. Ford Int'l Airport Authority Mailing address <i>(principal place of business)</i> : 5500 44th Street SE Grand Rapids, MI 49512	Contract Description <i>(name and location)</i> : Natural Treatment System Improvements, Phase 1 5500 44 th Street SE Grand Rapids, MI 49512 Contract Price: Effective Date of Contract:
Bond Bond Amount: Date of Bond: <i>(Date of Bond cannot be earlier than Effective Date of Contract)</i> Modifications to this Bond form: <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 16	
Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Performance Bond, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.	
Contractor as Principal	Surety
_____ <i>(Full formal name of Contractor)</i>	_____ <i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <div style="text-align: center;"><i>(Signature)</i></div>	By: _____ <div style="text-align: center;"><i>(Signature)(Attach Power of Attorney)</i></div>
Name: _____ <div style="text-align: center;"><i>(Printed or typed)</i></div>	Name: _____ <div style="text-align: center;"><i>(Printed or typed)</i></div>
Title: _____	Title: _____
Attest: _____ <div style="text-align: center;"><i>(Signature)</i></div>	Attest: _____ <div style="text-align: center;"><i>(Signature)</i></div>
Name: _____ <div style="text-align: center;"><i>(Printed or typed)</i></div>	Name: _____ <div style="text-align: center;"><i>(Printed or typed)</i></div>
Title: _____	Title: _____
<i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i>	

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.
2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond will arise after:
 - 3.1. The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice may indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 will be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement does not waive the Owner's right, if any, subsequently to declare a Contractor Default;
 - 3.2. The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
 - 3.3. The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.
4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 does not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.
5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:
 - 5.1. Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;
 - 5.2. Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;
 - 5.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or
 - 5.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

- 5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
 - 5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.
- 6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment, or the Surety has denied liability, in whole or in part, without further notice, the Owner shall be entitled to enforce any remedy available to the Owner.
- 7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner will not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety will not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:
 - 7.1. the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
 - 7.2. additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and
 - 7.3. liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.
- 8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.
- 9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price will not be reduced or set off on account of any such unrelated obligations. No right of action will accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.
- 10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
- 11. Any proceeding, legal or equitable, under this Bond must be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and must be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit will be applicable.
- 12. Notice to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears.
- 13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted therefrom and provisions conforming to such

statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

14. Definitions

- 14.1. *Balance of the Contract Price*—The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.
 - 14.2. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.
 - 14.3. *Contractor Default*—Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.
 - 14.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
 - 14.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.
15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.
16. Modifications to this Bond are as follows: **[Describe modification or enter “None”]**

PAYMENT BOND

<p>Contractor</p> <p>Name: _____</p> <p>Address <i>(principal place of business)</i>: _____</p>	<p>Surety</p> <p>Name: _____</p> <p>Address <i>(principal place of business)</i>: _____</p>
<p>Owner</p> <p>Name: Gerald R. Ford Int'l Airport Authority</p> <p>Mailing address <i>(principal place of business)</i>: 5500 44th Street SE Grand Rapids, MI 49512</p>	<p>Contract</p> <p>Description <i>(name and location)</i>: Natural Treatment System Improvements, Phase 1 5500 44th Street SE Grand Rapids, MI 49512</p> <p>Contract Price: _____</p> <p>Effective Date of Contract: _____</p>
<p>Bond</p> <p>Bond Amount: _____</p> <p>Date of Bond: _____ <i>(Date of Bond cannot be earlier than Effective Date of Contract)</i></p> <p>Modifications to this Bond form: <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 18</p>	
<p>Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Payment Bond, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.</p>	
Contractor as Principal	Surety
_____ <i>(Full formal name of Contractor)</i>	_____ <i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature)(Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<p><i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i></p>	

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.
2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond will arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
5. The Surety's obligations to a Claimant under this Bond will arise after the following:
 - 5.1. Claimants who do not have a direct contract with the Contractor
 - 5.1.1. have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
 - 5.1.2. have sent a Claim to the Surety (at the address described in Paragraph 13).
 - 5.2. Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
 - 7.1. Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
 - 7.2. Pay or arrange for payment of any undisputed amounts.
 - 7.3. The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 will not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

8. The Surety's total obligation will not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond will be credited for any payments made in good faith by the Surety.
9. Amounts owed by the Owner to the Contractor under the Construction Contract will be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfying obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.
11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
12. No suit or action will be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit will be applicable.
13. Notice and Claims to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, will be sufficient compliance as of the date received.
14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted here from and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.
15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.
16. Definitions
 - 16.1. *Claim*—A written statement by the Claimant including at a minimum:
 - 16.1.1. The name of the Claimant;
 - 16.1.2. The name of the person for whom the labor was done, or materials or equipment furnished;
 - 16.1.3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
 - 16.1.4. A brief description of the labor, materials, or equipment furnished;

- 16.1.5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
 - 16.1.6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
 - 16.1.7. The total amount of previous payments received by the Claimant; and
 - 16.1.8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.
- 16.2. *Claimant*—An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic’s lien or similar statute against the real property upon which the Project is located. The intent of this Bond is to include without limitation in the terms of “labor, materials, or equipment” that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor’s subcontractors, and all other items for which a mechanic’s lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.
- 16.3. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.
- 16.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
- 16.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.
17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.
18. Modifications to this Bond are as follows: **[Describe modification or enter “None”]**

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared By



Endorsed By



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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 5. *Bidder*—An individual or entity that submits a Bid to Owner.
 6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 9. *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.
 10. *Claim*
 - 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, made pursuant to Paragraph 12.01.A.4, concerning disputes 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.
11. *Constituent 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.
 12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.
 13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
 14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.
 15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
 16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
 17. *Cost of the Work*—See Paragraph 13.01 for definition.
 18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
 19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
 20. *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.
 21. *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.

22. *Engineer*—The individual or entity named as such in the Agreement.
23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
24. *Hazardous Environmental Condition*—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.
25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.
28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
29. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
31. *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.

32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.
34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals.
36. *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.
37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
38. *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.
39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
40. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
41. *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.
42. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part

thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion of such Work.

43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.
44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
45. *Supplier*—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
46. *Technical Data*
- a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.
 - b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.
 - c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.
47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.
48. *Unit Price Work*—Work to be paid for on the basis of unit prices.
49. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives*: The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the 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 is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day*: The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective*: The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
1. does not conform to the Contract Documents;
 2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 3. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or Paragraph 15.04).
- E. *Furnish, Install, Perform, Provide*
1. The word “furnish,” when used in connection with services, materials, or equipment, means 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.
 2. The word “install,” when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.

4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
- F. *Contract Price or Contract Times*: References to a change in “Contract Price or Contract Times” or “Contract Times or Contract Price” or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term “or both” is not expressed.
- G. Unless stated otherwise in the Contract Documents, words or phrases that 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 Performance and Payment Bonds; Evidence of Insurance*

- A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.
- C. *Evidence of Owner’s Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:
1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 2. a preliminary Schedule of Submittals; and
 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work, and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will be made to Contractor until acceptable schedules are submitted to Engineer.
1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.
 4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.
- B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall 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, REQUIREMENTS, 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.

3.02 *Reference Standards*

A. *Standards Specifications, Codes, Laws and Regulations*

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
2. No provision of any such standard specification, manual, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer take

precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

- a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
- b. 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 the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the 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 Article 12.

3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media versions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein precludes Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract 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 Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work may be done at the Site prior to such date.

4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *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 an equitable adjustment in Contract Price or 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 of 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. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 2. Abnormal weather conditions;
 3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and
 4. 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 11.
- 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 11.07.

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.

- F. 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 Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.
- G. Paragraph 8.03 addresses 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.

ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*

- 1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
- 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise;

(b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and 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 relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading of Structures:* 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 structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
 - 1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;
 - 2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and
 - 3. Technical Data contained in such reports and drawings.
- B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.
- C. *Reliance by Contractor on Technical Data:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.

- D. *Limitations of Other Data and Documents:* Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, 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;
 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;
 3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or
 4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:
1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;
 2. is of such a nature as to require a change in the Drawings or Specifications;
 3. differs materially from that shown or indicated in the Contract Documents; or
 4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- 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 whether it is necessary for Owner to obtain 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 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the 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. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

E. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, 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 5.04.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 13.03; and,
- c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

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;
- 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 required by Paragraph 5.04.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, then any such adjustment will be set forth in a Change Order.

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, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

F. *Underground Facilities; Hazardous Environmental Conditions*: Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities.

Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities*: Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:
1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 2. complying with applicable state and local utility damage prevention Laws and Regulations;
 3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;
 4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings 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 7.15), notify Owner and Engineer in writing regarding such Underground Facility.
- C. *Engineer's Review*: Engineer will:
1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;
 2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;
 3. obtain any pertinent cost or schedule information from Contractor; 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 Underground Facility; and
 4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility*: 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 Underground Facility 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.

E. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

F. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown or indicated on the Drawings, 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. 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 13.03;
 - b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and
 - c. Contractor gave the notice required in Paragraph 5.05.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, then any such adjustment will be set forth in a Change Order.
3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.
4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;

2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
 3. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, 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;
 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 other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly 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 condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (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.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.
- H. If, after receipt of such 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 the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and 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 relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.
- B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.
- C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or Regulations, and must be issued and signed by a surety named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.
- D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.
- E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.
- F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.
- G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.
- H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the

- required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Alternative forms of insurance coverage, including but not limited to self-insurance and “Occupational Accident and Excess Employer’s Indemnity Policies,” are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.
 - D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.
 - E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.
 - F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party’s full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party’s obligation to obtain and maintain such insurance.
 - G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner’s option, may purchase and maintain Owner’s own liability insurance. Owner’s liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner’s liability policies for any of Contractor’s obligations to the Owner, Engineer, or third parties.
 - H. Contractor shall require:
 - 1. Subcontractors to purchase and maintain worker’s compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor’s liability policies) on each Subcontractor’s commercial general liability insurance policy; and

2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.
 - I. If either party does not purchase or maintain the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
 - J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.
 - K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.
 - L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.
 - M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.
 - N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 *Contractor's Insurance*

- A. *Required Insurance:* Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.
- B. *General Provisions:* The policies of insurance required by this Paragraph 6.03 as supplemented must:
 1. include at least the specific coverages required;
 2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;
 3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;

4. apply with respect to the performance of the Work, whether such performance is by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable; and
 5. include all necessary endorsements to support the stated requirements.
- C. *Additional Insureds*: The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:
1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;
 2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;
 3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);
 4. not seek contribution from insurance maintained by the additional insured; and
 5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 *Builder's Risk and Other Property Insurance*

- A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.
- B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.
- C. *Property Insurance for Substantially Complete Facilities*: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.

- D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.
- E. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

- A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.
 - 1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.
 - 2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.

1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.
- C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.
- D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.
- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

- A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at

Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, 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.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall maintain good discipline and order at the Site.
- B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.
- C. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.04 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide 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 performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment must be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.05 "Or Equals"

- A. *Contractor's Request; Governing Criteria:* Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.
1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that the proposed item:
 - 1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) has a proven record of performance and availability of responsive service; and
 - 4) is not objectionable to Owner.
 - b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense:* Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.
- D. *Effect of Engineer's Determination:* Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.

- E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an “or-equal” item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 *Substitutes*

- A. *Contractor’s Request; Governing Criteria*: Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.
1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.
 2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
 3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:
 - a. will certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design;
 - 2) be similar in substance to the item specified; and
 - 3) be suited to the same use as the item specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from the item specified; and
 - 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in

Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- E. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination:* If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 *Concerning Subcontractors and Suppliers*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.
- B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or

otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.

- E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.
- F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.
- H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.
- J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.
- K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.
- L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.
- M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *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 an 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 will be disclosed in the Contract Documents.

- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors, from and against all claims, costs, losses, and 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 relating to 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 specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against all claims, costs, losses, and 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 relating to 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.

7.09 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

7.10 *Taxes*

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

7.11 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and 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 relating to

such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.

- C. Owner or Contractor may give written 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 written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.
- B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.
- C. 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 Site or who may be affected by the Work;
 - 2. all the Work and materials and 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, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any

of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

- E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.
- F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- G. 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.
- H. 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.
- I. 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 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).
- J. 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.

7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as material 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 Laws or Regulations.

7.15 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent 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 by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 Submittals

A. Shop Drawing and Sample Requirements

1. Before submitting a Shop Drawing or Sample, Contractor shall:
 - a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determine and verify:
 - 1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;
 - 2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - 3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;
 - c. confirm that the Submittal is complete with respect to all related data included in the Submittal.
2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.
3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.

B. Submittal Procedures for Shop Drawings and Samples: Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.

1. Shop Drawings

- a. Contractor shall submit the number of copies required in the Specifications.
- b. Data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide, and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.C.

2. Samples

- a. Contractor shall submit the number of Samples required in the Specifications.
- b. Contractor shall clearly identify each Sample 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 7.16.C.

3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. Engineer's Review of Shop Drawings and Samples

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. Engineer's review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Work, comply with the requirements of the Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, or to safety precautions or programs incident thereto.
3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.
5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.
8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. Resubmittal Procedures for Shop Drawings and Samples

1. 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 and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous Submittals.
2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two

resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.

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

E. *Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs*

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:
 - a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.
 - b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.
 - c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.
 - d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.
2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03, 2.04, and 2.05.

- F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

7.17 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer is entitled to rely on Contractor's warranty and guarantee.
- B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:
 1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and

2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.
- C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 2. normal wear and tear under normal usage.
- D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:
1. Observations by Engineer;
 2. Recommendation by Engineer or payment by Owner of any progress or final payment;
 3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 4. Use or occupancy of the Work or any part thereof by Owner;
 5. Any review and approval of a Shop Drawing or Sample submittal;
 6. The issuance of a notice of acceptability by Engineer;
 7. The end of the correction period established in Paragraph 15.08;
 8. Any inspection, test, or approval by others; or
 9. Any correction of defective Work by Owner.
- E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from losses, damages, costs, and judgments (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 from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity

directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable.

- B. In any and all claims against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A will not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

7.19 *Delegation of Professional Design Services*

- A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.
- B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.
- C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.
- D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.
- E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:
 - 1. Checking for conformance with the requirements of this Paragraph 7.19;
 - 2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and
 - 3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.
- F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.

- G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the 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 the 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 Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.
- D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.
- E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.
- F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be

set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 2. An itemization of the specific matters to be covered by such authority and responsibility; and
 3. The extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

- A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.
- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.
1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.
 2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.

- C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and 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 relating to such damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

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

9.02 *Replacement of Engineer*

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.

9.03 *Furnish Data*

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

9.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

- A. The 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 performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *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 are set forth in the Contract.

10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, 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 performance of the Work.

10.03 *Resident Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.
- B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 *Engineer's Authority*

- A. Engineer has the authority to reject Work in accordance with Article 14.
- B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.
- C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.
- D. Engineer's authority as to changes in the Work is set forth in Article 11.
- E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.06 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.07 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, will create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any

Supplier, any other individual or entity, or to any surety for or 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 performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs of which Engineer has been informed.

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

- A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
- B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.
- C. All changes to the Contract that 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, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 *Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders covering:
 - 1. Changes in 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 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, 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 that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.
- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 *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 11.07 regarding change of Contract Price.
- B. If Owner has issued a Work Change Directive and:
1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.
 2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 *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 also on 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, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 *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. Changes involving

the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.

- B. Such changes in the Work 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. 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 must be performed under the applicable conditions of the Contract Documents.
- C. Nothing in this Paragraph 11.05 obligates 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.

11.06 *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 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 *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 must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.
- 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 13.03);
 - 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 11.07.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 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).
- C. *Contractor's Fee:* When applicable, the Contractor's fee for overhead and profit will be determined as follows:
 - 1. A mutually acceptable fixed fee; or
 - 2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. For costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;
 - b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 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 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.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; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;
- d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
- e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and
- f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

11.08 *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 must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.
- B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

11.09 *Change Proposals*

- A. *Purpose and Content:* Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, 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.

B. *Change Proposal Procedures*

1. *Submittal*: Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.
2. *Supporting Data*: The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.
 - a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.
 - b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

The supporting data must 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.

3. *Engineer's Initial Review*: Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.
 4. *Engineer's Full Review and Action on the Change Proposal*: Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must 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 Article 12.
 5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- C. *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 in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.
- D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 *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 12—CLAIMS

12.01 *Claims*

- A. *Claims Process*: The following disputes between Owner and Contractor are subject 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;
 - 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; and
 - 4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.
- 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 30 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 the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, 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 will be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation*
 - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.
 - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal

and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor 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 will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13—COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the 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 13.01 are used for two distinct purposes:
 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
 2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:
 1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe

benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.

2. Cost 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 accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor 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, which will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.
5. Other costs consisting of the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, 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.
 - 1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.
 - c. *Construction Equipment Rental*
 - 1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment,

machinery, or parts must cease when the use thereof is no longer necessary for the Work.

- 2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.
 - 3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.
- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
 - e. 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.
 - f. 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 builder's risk or other property insurance established in accordance with Paragraph 6.04), 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 include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.
 - g. The cost of utilities, fuel, and sanitary facilities at the Site.
 - h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
 - i. 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 does not include any of the following items:
1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, 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 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.

2. The cost of purchasing, renting, or furnishing small tools and hand tools.
3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
5. 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.
6. Expenses incurred in preparing and advancing Claims.
7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*

1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:
 - a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.
 - b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:
 - 1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.
 - 2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.
2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

- E. *Documentation and Audit:* Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 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 on 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 for any of the foregoing will be valid.
- C. *Owner's Contingency Allowance*: Contractor agrees that an Owner's 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 for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

13.03 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 Agreement.
- 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 with Contractor the Engineer's preliminary determinations 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, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.
- E. *Adjustments in Unit Price*
 - 1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:
 - a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

- b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.
2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.
3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

14.01 Access to Work

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply with such procedures and programs as applicable.

14.02 Tests, Inspections, and Approvals

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
 1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
 3. by manufacturers of equipment furnished under the Contract Documents;
 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and

5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *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.
- C. *Notice of Defects:* Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved

by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work will be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then 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, and provide all necessary labor, material, and equipment.
 - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 - 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *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 perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *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 defective Work as required by Engineer, then

Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.

- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or 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, 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 and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include 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 Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15—PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

- A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments*
 - 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.
 - 2. 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 must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or 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.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. 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.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. 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.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work;
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;

- c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
- a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
 - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. Payment Becomes Due

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. Reductions in Payment by Owner

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
- a. 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, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
 - b. 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;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

- e. 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;
 - f. The Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. The Contract Price has been reduced by Change Orders;
 - i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;
 - j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. 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; or
 - l. Other items entitle Owner to a set-off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, 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, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.
 3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 *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. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will 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 therefor. 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 the 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.

15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.

2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly 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, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

A. *Application for Payment*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.
2. The final Application for Payment must be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
 - d. a list of all duly pending Change Proposals and Claims; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment

bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

- B. *Engineer's Review of Final Application and Recommendation of Payment:* 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 as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment 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 for Payment.
- C. *Notice of Acceptability:* In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.
- D. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.
- E. *Final Payment Becomes Due:* Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 *Waiver of Claims*

- A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim, appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
1. correct the defective repairs to the Site or such adjacent areas;
 2. correct such defective Work;
 3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.
- B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.
- C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all costs, losses, and 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 relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.
- D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *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's persistent failure 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);
 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:
 1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and
 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as

to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate 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 of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. 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, plus fair and reasonable sums for overhead and profit on such expenses; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 7 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 *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, pursuant to Article 12; and
 2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise 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;
 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, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

- A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:
1. in person, by a commercial courier service or otherwise, to the recipient's place of business;
 2. by registered or certified mail, postage prepaid, to the recipient's place of business; or
 3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 *Computation of Times*

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

- 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 are not to 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 Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be

as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall 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.

18.05 *No Waiver*

- A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination of the Contract or of the services of Contractor.

18.07 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Assignment of Contract*

- A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is 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.

18.09 *Successors and Assigns*

- A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

18.10 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

SUPPLEMENTARY CONDITIONS

Natural Treatment System Improvements, Phase 1

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Caption and Introductory Statements

Supplementary Conditions

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC C-700 (2018 Edition). All provisions which are not so amended or supplemented remain in full force and effect.

Unless otherwise noted, the terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added thereto.

ADDITIONS, DELETIONS AND CHANGES TO GENERAL CONDITIONS

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

SC-1.01 Defined Terms

SC-1.01 Add the following new paragraph immediately after Paragraph 1.01.A.22:

22.1 *Falsework*--temporary construction work on which a main work is wholly or partly built and/or supported until the main work is strong enough to support itself.

SC-1.01 Add the following new paragraph immediately after Paragraph 1.01.A.32:

32.1 *Project Manual* – the written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.

SC-1.02 Terminology

SC-1.02 Add the following new sentence immediately after the last sentence in Paragraph

1.02.B:

The use of any such term or adjective is not intended to and shall not be effective to relieve the Contractor of responsibility to comply with all Laws and Regulations applicable to the performance of the Work, or to perform the Work in accordance with the provisions of Article 7, or to comply with any other provision of the Contract Documents.

ARTICLE 2 - PRELIMINARY MATTERS

SC-2.03 Before Starting Construction

SC-2.03 Delete Paragraph 2.03.A in its entirety and insert the following in its place:

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement, Contractor shall submit to Owner and Engineer for timely review:
 - 1. A preliminary Progress Schedule indicating the times (number of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;
 - 2. A preliminary Schedule of Submittals; and
 - 3. A preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

SC-2.05 Acceptance of Schedules

SC-2.05 Delete Paragraph 2.05.A in its entirety and insert the following in its place:

- A. Upon Owner's, Engineer's or Contractor's request at least ten days before submission of the first Application for Payment a conference, attended by Contractor, Owner, Engineer and others as appropriate, will be held to review for acceptability to Owner as provided below the schedules submitted in accordance with paragraph 2.03.A. If a schedule is not acceptable, Contractor shall have an additional ten days to make corrections and adjustments and to complete and resubmit the schedules. Upon notice by Owner, no progress

payment shall be made to Contractor until acceptable schedules are submitted and accepted by Owner.

1. The Progress Schedule will be acceptable to Owner if it provides an orderly progression of the Work to completion within any specified Milestones and the Contract Time, and if acceptable to Engineer. Such acceptance will not impose on Owner or Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
2. Contractor's Schedule of Submittals will be acceptable to Owner if acceptable to Engineer and if it provides a workable arrangement for reviewing and processing the required submittals.
3. Contractor's Schedule of Values will be acceptable to Owner as to form and substance if it is acceptable to Engineer and if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

SC-3.01 Intent

SC-3.01 Add the following new sentence immediately after the last sentence in Paragraph 3.01.B:

Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.

SC-3.02 Reference Standards

SC-3.02.A.2 Delete Paragraph 3.02.A.2 in its entirety and insert the following in its place:

No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part

of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

SC-3.03 Reporting and Resolving Discrepancies

A. Reporting Discrepancies

SC-3.03 Delete Sub-Paragraph 3.03.A.3 in its entirety and insert the following in its place:

3. Contractor shall not be entitled to any increase in the Contract Amount or Contract Time for any conflicts, errors, ambiguities or discrepancies in the Contract Documents that were known, or that should have been known to Contractor, or which could have been discovered by Contractor as part of its review of the bidding requirements and Contract Documents prior to bidding or its review of the Contract Documents prior to undertaking any part of the Work.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

SC-4.01 Commencement of Contract Times; Notice to Proceed

SC-4.01 Delete Paragraph 4.01.A in its entirety and insert the following in its place:

A. The Contract Times will commence to run on the day indicated in the Notice to Proceed.

SC-4.05 Delays in Contractor's Progress

SC-4.05 Add the following new paragraph immediately after Paragraph 4.05.G

H. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under Paragraph 4.05 within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 - SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

SC-5.03 *Subsurface and Physical Conditions*

SC-5.03.A Delete Paragraph 5.03.A in its entirety and insert the following in its place:

- A. *Reports and Drawings:* The Contract Documents may identify:
1. Those soil borings, plans, drawings, surveys or other reports of explorations of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Contract Documents;
 2. Those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site, (Except Underground Facilities) that Engineer has used in preparing the Contract Documents; and
 3. Technical Data contained in such *Reports and Drawings*.

The soil borings, plans, drawings, surveys, technical data, and other documents referenced in Paragraphs 5.03.A.1, 2 and 3 are collectively called "*Reports and Drawings*."

SC-5.03.C Delete Paragraph 5.03.C in its entirety and insert the following in its place:

- C. *Reliance by Contractor Not Authorized.* Contractor may not rely upon the *Reports and Drawings* referenced in 5.03.A or make any claim against Owner, Engineer, or any of Owner's or Engineer's Consultants or Subcontractors related to the *Reports and Drawings*. This limitation includes but is not limited to:
1. The accuracy or 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. The accuracy or completeness of other data, interpretations, opinions, and information contained in, shown on, or indicated in the *Reports and Drawings*; or
3. Any Contractor interpretation of or conclusion drawn from any of the *Reports and Drawings* or any other Technical Data, data, interpretations, opinions or information referenced in the *Reports and Drawings*.

The *Reports and Drawings*, including the information contained therein, are offered to the Contractor only as information relied upon by Engineer in the preparation of the Contract Documents, and the Contractor is solely responsible for confirming actual conditions. Neither the Engineer nor the Owner, nor the Consultants or Subcontractors of either have any responsibility for any conclusion, interpretation or analysis contained therein or made by the Contractor based upon the Contractor's review of the *Reports and Drawings*.

Neither Owner nor Engineer has any responsibility for and does not warrant that the soils or water table encountered during construction will be as shown in the *Reports and Drawings*.

SC-5.03.D

Delete Paragraph 5.03.D in its entirety and insert the following in its place:

- D. Contractor warrants that before submitting a bid the Contractor has determined the soil and subsoil conditions, including the water table elevation and the conditions to be encountered by Contractor in the performance of the Work and that said conditions and factors have been evaluated by Contractor and incorporated into his Contract with Owner. Contractor further warrants that the Contractor is fully aware of the soil conditions, subsoil conditions, water table and all applicable State and Federal Regulations related to the excavation, removal, transportation, placement and relocation of the materials involved in the Work to be performed by the Contractor and that Contractor

will complete the Work under whatever conditions he may encounter or create without extra cost, expense to or claim against the Owner or Engineer, their Consultants or Subcontractors.

Contractor has identified all locations where the Contractor's operations are near public roadways, the properties of railroads or contiguous physical structures. Work shall not take place until Contractor has made all arrangements necessary to identify the location and/or elevation of the roadways, the properties of railroads or contiguous physical structures and foundation or appurtenances and has taken all necessary steps to protect the roadways, the properties of railroads or contiguous physical structures from damage. Contractor is solely responsible for any and all damage to roadways, the properties of railroads or contiguous physical structures and any personal injury, death or property damage or consequential damages arising from Contractor's operations.

SC-5.04 *Differing Subsurface or Physical Conditions*

SC-5.04.A Delete Paragraph 5.04.A in its entirety and insert the following in its place:

- A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:
1. is of such a nature as to require a change in the Contract Documents; or
 2. is of an unusual nature and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, within 48 hours after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by paragraph 7.15), notify

Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so. If notice as provided in the section is not given, no change in Contract Price shall be considered or allowed.

SC-5.04.B Delete Paragraph 5.04.B in its entirety and insert the following in its place:

- B. *Engineer's Review:* After receipt of written notice as required by Paragraph 5.04.A, Engineer will review the information provide by Contractor. If Engineer, in Engineer's sole discretion, determines that additional explorations and/or tests are needed to evaluate Contractor's belief that there are differing subsurface or physical conditions, then Contractor, at Contractor's sole expense, shall promptly undertake those additional explorations and/or tests, and provide the results to Engineer. Engineer will then review the information provided by Contractor along with any other information Engineer believes is pertinent, and advise Owner in writing (with a copy to Contractor) of Engineer's findings, conclusions and recommendations.

If after receipt of written notice as required by Paragraph 5.04.A, Engineer, in Engineer's sole discretion, determines that additional explorations and/or tests are not needed to evaluate Contractor's belief that there are differing subsurface or physical conditions, Engineer will review the information provided by Contractor, along with any other information Engineer believes is pertinent, and advise Owner in writing (with copy to Contractor) of Engineer's findings, conclusions and recommendations.

Owner reserves the right at its own expense to undertake additional exploration and/or testing. This reservation in no way waives the responsibility of the Contractor to undertake additional explorations and/or tests, if required, as set forth above.

SC-5.05 *Underground Facilities*

SC-5.05.A Delete Paragraph 5.05.A in its entirety and insert the following in its place:

- A. *Contractor's Responsibilities:* The information and data shown or indicated in the Contract Documents with respect to existing

Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others.

1. The Underground Facilities shown on or indicated in the Contract Documents are located according to the information available to the Engineer at the time of the preparation of the Contract Documents. Neither the Engineer nor the Owner guarantee the accuracy or completeness of any such information or data, including but not limited to information provided by the Owner;
2. The Contractor is solely responsible for identifying the actual location of all Underground Facilities and shall verify the location and/or elevations of the Underground Facilities prior to undertaking construction;
3. At all locations where the Contractor's operations are near, will cross or contact Underground Facilities, no part of the Work shall commence until Contractor has made all arrangements necessary to identify the location and/or elevation of the Underground Facility, including contacting MISS DIG, has notified the owner of the Underground Facility, and has taken all necessary steps to protect the Underground Facility from damage.
4. 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 Underground Facilities at the Site;
 - b. complying with applicable state and local utility damage prevention Laws and Regulations;
 - c. locating all Underground Facilities shown or indicated in the Contract Documents;
 - d. verifying the actual location of those Underground

Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;

- e. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction;
 - f. the safety and protection of all such Underground Facilities and related above ground structures, including but not limited to shoring, bracing, supporting and maintenance of all Underground Facilities and related above ground structures affected by the Contractor's operations;
 - g. repairing any damage to Underground Facilities and related above ground structures resulting from the Work; and
 - h. any personal injury, death or property damage or consequential damages arising from Contractor's Work.
5. In the event of the interruption of or damage to an Underground Facility as the result of Contractor's operations, the Contractor shall immediately notify the Underground Facility owner and shall take all steps necessary to cooperate with and assist the Underground Facility owner in the restoration and repair of the Underground Facility. Said repair work shall be continuous and shall not result in any delay of the Project or increased cost or expense to Owner, or claim against Owner, Engineer or their Consultants.

SC-5.05.B Delete Paragraph 5.05.B in its entirety and insert the following in its place:

- B. *Notice by Contractor:* If an Underground Facility is uncovered or revealed at or adjacent to the Site which was not shown or indicated in the Contract Documents, 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 paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

SC-5.05.C Delete Paragraph 5.05.C in its entirety and insert the following in its place:

- C. *Engineer's Review:* Engineer will review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. If Engineer concludes that a change in the Contract Documents is required, Engineer shall prepare recommendations to the Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; 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 Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. At all times, Contractor shall be solely responsible for the safety and protection of such Underground Facility.

SC-5.05.F. Delete Paragraph 5.05.F.1 in its entirety and insert the following in its place:

F. *Possible Price and Times Adjustment*

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated in the Contract Documents, subject 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 Underground Facility 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 13.03;

- c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and
- d. Contractor gave the notice required in Paragraph 5.05.B.

SC-5.06 *Hazardous Environmental Conditions at Site*

SC-5.06.A Delete Paragraph 5.06.A in its entirety and insert the following in its place:

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. The following reports regarding Hazardous Environmental Conditions at the Site were utilized by the Engineer in the preparation of the Contract Documents:

a. *None*

2. The following drawings regarding Hazardous Environmental Conditions at the Site were utilized by the Engineer in the preparation of the Contract Documents:

a. *None*

3. Technical Data contained in such *Reports and Drawings*.

SC-5.06.B Delete Paragraph 5.06.B in its entirety and insert the following in its place:

B. *Reliance by Contractor Not Authorized*: Contractor may not make any Claim against Owner, Engineer or the Consultants of either with respect to:

1. The completeness of such reports, drawings and/or Technical Data, 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, the cost of Work and safety precautions and programs incident thereto; or

2. The accuracy of any Technical Data, or any other data,

interpretations, opinions and information contained in such reports or shown or indicated on such drawings; or

3. Any Contractor interpretation of or conclusion drawn from any such report, drawing or Technical Data.

ARTICLE 6 - BONDS AND INSURANCE

6.02 Insurance—General Provisions

SC-6.02 Delete Paragraph 6.02.A in its entirety and insert the following in its place:

A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Insurance Specification.

SC-6.02 Delete Paragraphs 6.02.B through 6.02.N in their entirety and replace with Insurance Specification.

6.03 Contractor's Insurance

SC-6.03 Delete Paragraph 6.03.A in its entirety and insert the following in its place:

A. *Required Insurance:* Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Insurance Specification.

SC-6.03 Delete Paragraphs 6.03.B through 6.03.C in their entirety and replace with Insurance Specification.

6.04 Builder's Risk and Other Property Insurance

SC-6.04 Delete the last sentence of Paragraph 6.04.A and insert the following in its place:

The specific requirements applicable to the builder's risk insurance are set forth in the Insurance Specification.

SC-6.04 Delete Paragraphs 6.04.B through 6.04.E in their entirety and replace with Insurance Specification.

6.05 *Property Losses; Subrogation*

SC-6.05 Delete Paragraphs 6.05.A through 6.05.D in their entirety and replace with Insurance Specification.

6.06 *Receipt and Application of Property Insurance Proceeds*

SC-6.06 Delete Paragraphs 6.06.A through 6.06.C in their entirety and replace with Insurance Specification.

ARTICLE 7 - CONTRACTOR'S RESPONSIBILITIES

SC-7.01 *Contractor's Means and Methods of Construction*

SC-7.01.A Add the following new sentence immediately after the last sentence in 7.01.A:

Nothing in the design, specifications or Contract Documents shall be deemed to constitute a specific means, method, technique, sequence, or procedure of construction. Contractor shall be solely responsible for ensuring that the completed Work conforms accurately to the Contract Documents.

SC-7.05 *"Or-Equals"*

SC-7.05.A Add the following sub-paragraph immediately after Paragraph 7.05.A.1.b.2:

3) the item will be functionally equal to the named item of material or equipment. Contractor warrants and assumes sole responsibility for the adequacy, performance and functioning of the "or-equal" material or equipment.

SC-7.06 *Substitutes*

SC-7.06.A.3.e Add the following sub-paragraph immediately following paragraph 7.06.A.3.d:

e. Contractor warrants that, if approved and incorporated into the Work, the "substitute item" will be functionally

equal to the named item of material or equipment. Contractor assumes sole responsibility for the adequacy, performance and functioning of the “substitute” item of material or equipment.

SC-7.07 Concerning Subcontractors and Suppliers

SC-7.07.D Delete Paragraph 7.07.D in its entirety and replace with the following paragraph:

- D. No later than two (2) business days after the bid opening, the Contractor shall submit to the Owner and Engineer for acceptance a list of the names and addresses of the Contractor’s Subcontractors, Suppliers and such other individuals and entities as the Owner requests.

SC-7.07 Add the following sub-paragraphs immediately following paragraph 7.07.M:

- N. Contractor shall require all Subcontractors, prior to commencement of any Work by the Subcontractor, to secure and keep in force the insurance coverages set forth in and required by the Insurance Specification.
- O. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors and Suppliers, whether initially or as a replacement, performing or furnishing any of the Work just as Contractor is responsible for Contractor’s own acts and omissions.

SC-7.08 Patent Fees and Royalties

SC-7.08.B Delete paragraph 7.08.B in its entirety.

SC-7.11 Laws and Regulations

SC-7.11.D Add the following new paragraph immediately after Paragraph 7.11.C:

- D. Contractor shall be solely responsible for compliance with all Federal and State Occupational Safety and Health Act (“OSHA”) requirements related to the Work and the Site, including, if applicable, the requirements of the Michigan Occupational Safety and Health Act (“MIOSHA”). Neither Owner nor Engineer

shall have any responsibility for construction site safety or OSHA or MIOSHA compliance. Contractor will indemnify and hold harmless Owner and Engineer from all claims, costs, fees, fines, penalties and expenses (including but not limited to all fees and charges of engineers, architects, attorneys and other professionals and all court, administrative proceeding, and dispute resolution costs) related in any way to claims related to construction site safety, OSHA or MIOSHA violations or charges.

SC-7.13 *Safety and Protection*

SC-7.13.A Amend the first sentence of Paragraph 7.13.A to read as follows:

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work, including but not limited to the enforcement of safety precautions and programs of all Subcontractors.

SC-7.13.D Amend Paragraph 7.13.D to read as follows:

- D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense.

SC-7.16 *Submittals*

SC-7.16.B.1 Amend paragraph 7.16.B.1.a to read as follows:

- a. Contractor shall submit to Engineer for approval eight (8) copies of all shop drawings.

SC-7.16.B.2 Amend paragraph 7.16.B.2.a to read as follows:

- a. Contractor shall submit to Engineer for approval eight (8) duplicates of each Sample.

SC-7.16.E Add the following new paragraph immediately after Paragraph 7.16.E.1.d:

- e. Contractor shall submit to Engineer for approval eight (8) duplicates of

each submittal.

SC-7.17 Contractor's General Warranty and Guarantee

SC-7.17.A Delete Paragraph 7.17.A in its entirety and replace with the following paragraph:

Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee. Contractor's warranty and guaranty that all Work will be in accordance with the Contract Documents and will not be defective includes but is not limited to all materials and equipment incorporated into the Work. Unless a longer duration is required by the Project Specifications, Contractor's warranty and guaranty that all Work will be in accordance with the Contract Documents and will not be defective will extend for at least one year after the date of Substantial Completion.

SC-7.17.D.8 Amend paragraph 7.17.D.8 to read as follows:

8. Any inspection, test, review, or approval by Engineer, the Resident Project Representative (if one is assigned to the Site), or by others;

SC-7.17.D.9 Amend Paragraph 7.17.D.9 to read as follows:

9. Any correction of defective Work by Owner; or

SC-7.17.D.10 Add the following new paragraph immediately after Paragraph 7.17.D.9:

10. Any acceptance by Owner, or any failure to do so.

SC-7.19 Delegation of Professional Design Services

SC-7.19.B Add the following new sentence immediately after the last sentence in 7.19.B:

The design professional must be licensed in the state or states where the Project is located.

SC-7.19.D Delete Paragraph 7.19.D in its entirety and replace with the following paragraph:

Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, drawings, calculations, specifications, Submittals, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.

ARTICLE 9 – OWNER’S RESPONSIBILITIES

SC-9.06 Insurance

SC-9.06.A. Delete Paragraph 9.06.A in its entirety and replace with the following paragraph:

- A. Owner’s responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in the Insurance Specifications.

ARTICLE 10 - ENGINEER’S STATUS DURING CONSTRUCTION

SC-10.01 Owner’s Representative

SC-10.01.A Delete Paragraph 10.01.A in its entirety and insert the following in its place:

- A. Engineer will be Owner’s representative during the construction period. The Engineer will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents. The authority and responsibilities of the Engineer as set forth in the Contract Documents shall not be restricted, extended or otherwise modified without the written consent of the Engineer and the Owner. Nothing in the Contract Documents shall create for the benefit of the Contractor, any Subcontractor, Supplier or other individual or entity, any contractual relationship between Engineers and any such Contractor, Subcontractor, Supplier or other individual or entity.

SC-10.02 Visits to Site

SC-10.02.A Amend Paragraph 10.02.A by striking the following words from the first sentence:

“at intervals appropriate to the various stages of construction”

SC-10.03 *Resident Project Representative*

SC-10.03.C Add the following new paragraphs immediately after Paragraph 10.03.C:

- C. If Engineer furnishes a Resident Project Representative (RPR), the RPR will be Engineer’s employee or agent at the Site. The RPR’s authority and responsibility is expressly limited to making observations of the progress that has been made and the quality of the various aspects of Contractor’s executed Work, and reporting same to Engineer. RPR will not be required to make exhaustive or continuous observations or inspections on the Site to check the quality or quantity of the Work. RPR’s efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. In addition to the limitations set forth in Paragraph 10.07, The RPR does not have the authority or responsibility to:
1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including “or-equal” items).
 2. Exceed limitations of Engineer’s authority as set forth in the Contract Documents.
 3. Undertake any of the responsibilities of Contractor, Subcontractors, Suppliers, or Contractor’s superintendent.
 4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of Contractor’s work.
 5. Advise on, issue directions regarding, or assume control over safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.
 6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.

7. Accept Shop Drawing or Sample submittals.
8. Authorize Owner to occupy the Project in whole or in part.
9. Interpret for Contractor or Owner any provision of the Contract Documents.
10. Stop the Work for any reason.

SC-10.07 Limitations on Engineer's Authority and Responsibilities.

SC-10.07.B Add the following sentence immediately after the last sentence in Paragraph 10.07.B:

Engineer may not stop the work or interfere with the progress of the Work. No decision made by the Engineer in good faith either to exercise or not exercise any authority or responsibility delegated to Engineer in the Contract Documents or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall be construed as interference with the progress of the Work. Engineer shall have no authority or responsibility to recommend alternate or possible safety activities or changes for the safety of the project, Contractor, Subcontractors, Suppliers, Owner, employees, third persons or their property.

SC-10.07.F Add the following new paragraph immediately after Paragraph 10.07.E:

F. Engineer will not be responsible for Contractor's failure to pay Subcontractors, Suppliers, employees, taxes, fees, permits, patent fees, copyright fees, royalties, licenses or monies due to any individual or entity.

SC-15.01 Progress Payments

SC-15.01.C Delete Paragraph 15.01.C.3.a and insert the following in its place:

a. Inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work; or

SC-15.01.C Delete the period at the end of the sentence in Paragraph 15.01.C.4.e and

insert the following in its place:

, or

SC-15.01.C Add the following new paragraphs immediately after Paragraph 15.01.C.4.e:

- f. for Contractor's failure to construct the Work or any part of the Work in conformance with the Contract Documents, or
- g. for defective Work.

SC-15.04 Partial Use or Occupancy

SC-15.04 Delete Paragraph 15.04.A.4 in its entirety and insert the following in its place:

- 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of the Insurance Specifications regarding builder's risk or other property insurance.

SC-15.07 Waiver of Claims

SC-15.07.A Delete Paragraph 15.07.A in its entirety and insert the following in its place:

- A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising (1) from unsettled Liens, (2) from defective Work, (3) from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, (4) from outstanding Claims by Owner, (5) from Contractor's continuing obligations under the Contract Documents, and (6) from late completion by Contractor, including without limitation liquidated damages or other damage.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

SC-17.01 Methods and Procedures

SC-17.01.B Delete Paragraph 17.01.B.1 in its entirety and insert the following in its place:

- 1. At Owner's sole option, Owner may demand in writing arbitration of the dispute;

SC-17.01.C Add the following new paragraph immediately after Paragraph 17.01.B

SC-17.01.C *Arbitration of Claims at Election of Owner*

1. If the Owner elects in writing to demand arbitration as set forth in Paragraph 17.01.1, the dispute will be decided by arbitration in accordance with the rules of the American Arbitration Association in effect as of the Effective Date of the Agreement
2. The demand for arbitration will be filed in writing with the Contractor and with the selected arbitrator, and a copy will be sent to Engineer for information.
3. The award rendered by the arbitrator(s) shall be consistent with the agreement of the parties, in writing, and include: (i) a concise breakdown of the award; and (ii) a written explanation of the award specifically citing the Contract Document provisions deemed applicable and relied on in making the award.
4. The award will be final. Judgment may be entered upon it in any court having jurisdiction thereof, and it will not be subject to modification or appeal except as provided by the controlling law governing vacating or modifying an arbitration award.
5. The fees and expenses of the arbitrators and any arbitration service shall be shared equally by Owner and Contractor.

ARTICLE 18 – MISCELLANEOUS

18.01 *Giving Notice*

SC-18.01 Delete Paragraph 18.01.A.3 in its entirety.

SOIL NOMENCLATURE AND TERMINOLOGY

DRILLING & SAMPLING DESIGNATIONS:

SS :	Split Spoon Sample (per ASTM D 1586)	HSA :	Hollow Stem Auger
LS :	Split Spoon Sample with 3" Liner Insert	SSA :	Solid Stem Auger
ST :	Shelby Tube Sample - 3" O.D., unless otherwise noted	RB :	Rock Bit (NX; BX; AX)
AS :	Auger Sample	PP :	Pocket Penetrometer Value
BS :	Bulk Sample	VS :	Vane Shear Value
		PM :	Pressuremeter test - in situ

STANDARD PENETRATION TEST (ASTM D-1586): A 2-inch OD, 1½-inch ID split barrel sampler is driven into undisturbed soil by means of repeating blows from a 140-pound hammer falling 30 inches. The sampler is driven three successive 6-inch increments; the total number of blows required for the final 12 inches of penetration is termed the Standard Penetration Resistance (N).

GRADATION DESCRIPTION & TERMINOLOGY:

Granular Soils (coarse-grained) have more than 50% of their dry weight retained on a #200 sieve; they are described as: *Boulders, Cobbles, Gravel* or *Sand*. Fine-Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are described as: *Clays* or *Clayey Silts* if they are cohesive, and *Silts* if they are non-cohesive. In addition to gradation, granular soils are defined based on their *in-situ density*; fine grained soils are further defined based on their strength or *consistency*, and on their *plasticity*.

<u>Major Soil Component</u>	<u>Gradation Range</u>	<u>Descriptive Term(s) (Of Minor Soil Constituents)</u>	<u>Percent of Dry Weight</u>
Boulders	Over 12 inches (305mm)	Trace	1 - 10
Cobbles	12 inches to 3 inches (305mm to 76mm)	Little	10 - 20
Gravel	Coarse 3 inches to ¾ inches (76mm to 19mm)	Some	20 - 35
	Fine ¾ inches to #4 sieve (19mm to 4.75mm)	And	35 - 50
Sand	Coarse #4 sieve to #10 sieve (4.75mm to 2.00mm)		
	Medium #10 sieve to #40 sieve (2.00mm to 0.425mm)		
	Fine #40 sieve to #200 sieve (0.425mm to 0.074mm)		
Silt	Passing #200 sieve (0.074mm) to 0.005mm		
Clay	Smaller than 0.005mm		

CONSISTENCY OF COHESIVE SOILS:

<u>Unconfined Comp Strength, Qu (tsf)</u>	<u>Consistency</u>
<0.25	Very Soft
0.25 – 0.50	Soft
0.50 – 1.00	Medium (firm)
1.00 – 2.00	Stiff
2.00 – 4.00	Very Stiff
4.00 – 8.00	Hard
>8.00	Very Hard

IN-SITU DENSITY OF GRANULAR SOILS:

<u>N - Blows/ft.</u>	<u>In-Situ Density</u>
0 - 4	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
50 +	Very Dense

WATER LEVEL MEASUREMENT:

Water levels indicated on the boring logs are the levels measured in the boring at the times indicated. It should be noted that groundwater levels observed during drilling in predominantly cohesive soils are not necessarily indicative of the static groundwater level. This is due to the relatively low permeability of clay soils and the tendency of drilling operations to temporarily seal off natural paths of groundwater migration into the borehole. Additionally, fluctuations in groundwater levels should be anticipated with seasonal variations and following periods of heavy or prolonged precipitation.

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INSURANCE SPECIFICATIONS

Insurance Required to be Purchased and Maintained by the Contractor

Contractor shall comply with all requirements of this Insurance Specification. Contractor shall purchase and maintain (i.e. keep in force) insurance which conforms to the requirements of this Insurance Specification.

1.1 Insurance—General Provisions

- 1.1.1** Contractor shall obtain and maintain insurance as required in this Insurance Specification.
- 1.1.2** All insurance required by the Contract to be purchased and maintained by Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- 1.1.3** Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Insurance Specification, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- 1.1.4** Failure of Owner to demand such certificates or other evidence of the Contractor's full compliance with these insurance requirements, or failure of Owner to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the Contractor's obligation to obtain and maintain such insurance.
- 1.1.5** If Contractor does not purchase or maintain all of the insurance required of Contractor by the Contract, Contractor shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- 1.1.6** If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16 of the General Conditions of the Contract.

- 1.1.7 Without prejudice to any other right or remedy, if Contractor has failed to obtain required insurance, Owner may elect to obtain equivalent insurance to protect Owner's interests at the expense of the Contractor, and the Contract Price shall be adjusted accordingly.
- 1.1.8 Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.
- 1.1.9 The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

1.2 Contractor's Insurance - Liability

- 1.2.1 **Owner's & Contractor's Protective Liability:** Contractor shall purchase and maintain an Owner's & Contractor's Protective Liability Policy ("OCP" Policy). The OCP policy shall name the Owner, the Engineer, their consultants, agents, and employees, as the insureds (hereinafter collectively called the "named insureds"). The OCP policy will protect the named insureds for any actual or alleged liability arising out of the work performed by the Contractor, the Subcontractor(s), or Suppliers, on this Project. The OCP policy will provide primary, non-contributing coverage.
- 1.2.2 **Workers' Compensation and Employer's Liability:** Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:
 - 1.2.2.1 Claims under workers' compensation, disability benefits, and other similar employee benefit acts.
 - 1.2.2.2 United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).
 - 1.2.2.3 Claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).
 - 1.2.2.4 Foreign voluntary worker compensation (if applicable).
- 1.2.3 **Commercial General Liability—Claims Covered:** Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:
 - 1.2.3.1 Claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.
 - 1.2.3.2 Claims for damages insured by reasonably available personal injury liability coverage.
 - 1.2.3.3 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

1.2.4 Commercial General Liability—Form and Content: Contractor’s commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:

1.2.4.1 Products and completed operations coverage: Such insurance shall be maintained for three years after final payment.

1.2.4.2 Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.

1.2.4.3 Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor’s contractual indemnity obligations in Paragraph 7.18.

1.2.4.4 Premises/operations liability.

1.2.4.5 Personal and advertising injury.

1.2.4.6 Broad form property damage coverage.

1.2.4.7 Severability of interest (the CGL policy shall apply to each named insured as if that named insured was the only named insured and the policy shall apply separately to each insured against whom claim is made or suit is brought).

1.2.4.8 Underground, explosion, and collapse coverage.

1.2.4.9 Personal injury coverage, including employees (with no exclusions pertaining to employment).

1.2.4.10 Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.

1.2.4.11 For design professional additional insureds, ISO Endorsement CG 20 32 07 04, “Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured” or its equivalent.

1.2.5 Automobile liability: Contractor shall purchase and maintain comprehensive automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle, including owned, non-owned, and hired motor vehicles. In light of standard policy provisions concerning (a) loading and unloading, and (b) definitions pertaining to motor vehicles licensed for road use versus unlicensed or self-propelled construction equipment, it is recommended that the comprehensive automobile liability insurance policy and the commercial

general liability policy be written by the same insurance carrier, though not necessarily in one the policy. The comprehensive automobile liability policy shall be written on an occurrence basis.

- 1.2.6 Umbrella or excess liability:** Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer’s liability, commercial general liability, aviation liability and automobile liability insurance described in the paragraphs above and in Section 1.2.10 below. The coverage afforded shall be at least as set for in Section 1.5.6. But if no box is checked in Section 1.5.6, then the umbrella/excess liability coverage limits will be \$2,000,000 per occurrence and \$2,000,000 general aggregate. The umbrella or excess liability insurance policy(ies) shall be an occurrence policy(ies)
- 1.2.7 Contractor’s pollution liability insurance:** Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result of pollution conditions arising from Contractor’s operations and completed operations. This insurance shall be maintained for no less than three years after final completion.
- 1.2.8 Railroad Protective Liability:** Contractor shall purchase and maintain a Railroad Protective Liability policy, where such an exposure exists, to provide coverage in the name of each railroad company having jurisdiction over rights-of-way across which Work under the Contract Documents is to be performed. The form of the policy and the limits of liability shall be determined by the railroad company(ies) involved.
- 1.2.9 Contractor’s professional liability insurance:** If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall purchase and maintain applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and 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.
- 1.2.10 Aviation Liability Insurance:** If required on this project as indicated by a check mark in Section 1.5.10, Contractor shall procure and maintain for the duration of the Contract insurance against claims for injuries to persons or damage to property which may arise from or in connection with the ownership, maintenance or use of Manned or Unmanned Aerial Vehicles, including but not limited to drone(s).
- 1.2.10.1 Minimum Scope and Limit of Insurance:** Aviation Liability Insurance on an “occurrence” basis, including products and

completed operations, property damage, bodily injury with limits no less than \$1,000,000 per occurrence, and \$2,000,000 in the aggregate. This coverage may also be provided by endorsement to the Contractor's Commercial General Liability policy.

1.3 The policies of insurance required to be purchased and maintained by the Contractor shall:

1.3.1 Additional insureds: The Contractor's commercial general liability, automobile liability, umbrella or excess, pollution liability policies and aviation liability insurance, shall include and list as additional insureds the Owner and Engineer, and the following individuals and entities:

Name

The additional insured coverage shall include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and every additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements. Each additional insured endorsement shall state that each additional insured is entitled to the same rights as the named insured in the event of cancellation, including but not limited to prior notice of cancellation.

1.3.2 Deductible Liability: Any and all deductibles in the policies described in this Insurance Specification shall be assumed by, for the account of, and be the sole responsibility of Contractor. The amount of any deductible is subject to approval by the Owner.

1.3.3 Insurance will be primary: The insurance required to be purchased and maintained by the Contractor under this Insurance Specification shall be primary (i.e. pay first) as respects any insurance, self-insurance or self-retention maintained by the Owner, Engineer, and any other insureds. Any insurance, self-insurance or self-retention maintained by the Owner, Engineer, or any other insureds, shall be in excess of the insurance purchased and maintained by the Contractor under this Insurance Specification, and shall not contribute with it.

1.3.4 Coverages: Include at least the specific coverages provided in this Insurance Specification.

- 1.3.5 Minimum Limits:** Be written for not less than the limits of liability provided in this Insurance Specification and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.
- 1.3.6 Notice of Cancellation:** Contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least ten (10) days prior written notice has been given to Contractor. Within three (3) days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.
- 1.3.7 Duration:** Remain in effect at least until final payment (and longer if expressly required in this Insurance Specification or the Supplementary Conditions) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.
- 1.3.8** Be appropriate for the Work being performed and provide protection to Contractor, Owner, Engineer, and any other additional insured, from claims that may arise out of or result from Contractor's, Sub-contractor's or Supplier's performance of the Work, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.
- 1.3.9** The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

1.4 Contractor's Insurance - Property

- 1.4.1 Builder's Risk:** If required on this project as indicated by a check mark in Section 1.5.7, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in this Insurance Specification, or the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
 - 1.4.1.1** Include the interests of Owner, Contractor, Subcontractors, Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors, of any of them, and any other individuals or entities required by this Insurance Specification and/or the Supplementary Conditions to be insured under such builder's risk policy. Each of whom shall be listed as a named insured (the parties required to be insured shall collectively be referred to as "insureds").
 - 1.4.1.2** Be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or

causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by this Insurance Specification and/or the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.

- 1.4.1.3** Cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
- 1.4.1.4** Cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).
- 1.4.1.5** Extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
- 1.4.1.6** Extend to cover damage or loss to insured property while in transit.
- 1.4.1.7** Allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
- 1.4.1.8** Allow for the waiver of the insurer's subrogation rights, as set forth below.

- 1.4.1.9** Provide primary coverage for all losses and damages caused by the perils or causes of loss covered.
 - 1.4.1.10** Not include a co-insurance clause.
 - 1.4.1.11** Include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.
 - 1.4.1.12** Include performance/hot testing and start-up.
 - 1.4.1.13** Be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer, with 30 days written notice to each other Insured.
- 1.4.2 Notice of Cancellation or Change:** All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this section shall contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least ten (10) days prior written notice has been given to the purchasing policyholder. Within three (3) days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.
- 1.4.3 Deductibles:** Contractor shall pay for costs not covered because of the application of a policy deductible.
- 1.4.4 Partial Occupancy or Use by Owner:** If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04 of the General Conditions of the Contract, then Owner, through Contractor, will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
- 1.4.5 Additional Insurance:** If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this section, it may do so at Contractor's expense.
- 1.4.6 Insurance of Other Property:** If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.
- 1.4.7 Waiver of Rights:** All policies purchased in accordance with this Section 1.4, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights

of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in this Insurance Specification, or the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses 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 or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

1.4.8 Sub-Contractors Waiver of Rights: Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in this Insurance Specification or the Supplementary Conditions, as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

1.4.9 Receipt and Application of Property Insurance Proceeds: Any insured loss under the builder's risk and other policies of insurance required by this section will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by this section shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of the Contract or applicable Laws and Regulations.

If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

1.5 Minimum limits

1.5.1 The minimum limits for the insurance required by this Insurance Specification shall provide coverage for not less than the following amounts or greater where required by Laws or Regulations:

1.5.2 Owner’s & Contractor’s Protective Liability Policy

1.5.2.1	Each Occurrence	\$1,000,000
1.5.2.2	General – Aggregate	\$2,000,000

1.5.3 Contractor’s Commercial General Liability Policy

1.5.3.1	General – Aggregate	\$2,000,000
1.5.3.2	Products – Completed Operations Aggregate	\$2,000,000
1.5.3.3	Personal and Advertising Injury	\$1,000,000
1.5.3.4	Each Occurrence	\$1,000,000
1.5.3.5	Fire damage	\$50,000
1.5.3.6	Medical Expense	\$5,000

1.5.4 Comprehensive Automobile Liability Policy (In accordance with Michigan’s No Fault Statute)

1.5.4.1	Combined Single Limit of	\$1,000,000
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1.5.5 Worker’s Compensation and Employer’s Liability Policy

1.5.5.1	Michigan	Statutory Limits
1.5.5.2	Employer’s Liability	
1.5.5.2.1	Each accident	\$ 500,000
1.5.5.2.2	Disease – each employee	\$ 500,000
1.5.5.2.3	Disease – policy limit	\$ 500,000
1.5.5.3	Federal, if applicable (e.g. FELA, Longshoreman’s, etc. . . .)	Statutory Limits

1.5.6 Excess or Umbrella Liability Policy

Unless increased limits are required as checked below, the limits shall be:

1.5.6.1	General Aggregate	\$2,000,000
1.5.6.2	Each Occurrence	\$2,000,000

Owner may select increased limits for this project as checked below; otherwise, the above limits shall apply if neither below option is checked:

<u>Option One</u>		<input type="checkbox"/> Check if required	
1.5.6.1	General Aggregate		\$5,000,000
1.5.6.2	Each Occurrence		\$5,000,000
<u>Option Two</u>		<input type="checkbox"/> Check if required	
1.5.6.1	General Aggregate		\$10,000,000
1.5.6.2	Each Occurrence		\$10,000,000
1.5.7	Builder's Risk "all risk" policy		Full Replacement Cost
	<input type="checkbox"/> Check if required		
	<i>Items to be covered by Builder's Risk include:</i>		
	<hr/>		
	<hr/>		
	<hr/>		
1.5.8	Contractor's Pollution Liability Policy		\$1,000,000
1.5.9	Railroad Protective Liability		
	<input type="checkbox"/> Check if required		\$
1.5.10	Aviation Liability Insurance		
	<input type="checkbox"/> Check if required		
1.5.10.1	General – Aggregate		\$2,000,000
1.5.10.2	Products – Completed Operations Aggregate		\$2,000,000
1.5.10.4	Each Occurrence		\$1,000,000
1.5.11	Other insurance	<input type="checkbox"/> Check if required (List Type)	\$



CERTIFICATE OF LIABILITY INSURANCE

OP ID: JF

DATE (MM/DD/YYYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER - - -	Phone:	CONTACT NAME:	
	Fax:	PHONE (A/C, No, Ext):	FAX (A/C, No):
		E-MAIL ADDRESS:	
		PRODUCER CUSTOMER ID #: _____	
		INSURER(S) AFFORDING COVERAGE	NAIC #
INSURED Owner's Name and Address - -	INSURER A: INSURANCE COMPANY		AM BEST FINANCIAL
	INSURER B:		
	INSURER C:		
	INSURER D:		
	INSURER E:		
	INSURER F:		

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
-- - - -	GENERAL LIABILITY						EACH OCCURRENCE	\$ 1,000,000
	<input type="checkbox"/> COMMERCIAL GENERAL LIABILITY						DAMAGE TO RENTED PREMISES (Ea occurrence)	\$
	<input type="checkbox"/> CLAIMS-MADE <input type="checkbox"/> OCCUR						MED EXP (Any one person)	\$
	<input checked="" type="checkbox"/> Owner's & Contractor's Prot						PERSONAL & ADV INJURY	\$
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	\$ 2,000,000
	<input type="checkbox"/> POLICY <input type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC						PRODUCTS - COMP/OP AGG	\$
	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident)	\$
	<input type="checkbox"/> ANY AUTO						BODILY INJURY (Per person)	\$
	<input type="checkbox"/> ALL OWNED AUTOS						BODILY INJURY (Per accident)	\$
	<input type="checkbox"/> SCHEDULED AUTOS						PROPERTY DAMAGE (Per accident)	\$
	<input type="checkbox"/> HIRED AUTOS							\$
	<input type="checkbox"/> NON-OWNED AUTOS							\$
	UMBRELLA LIAB <input type="checkbox"/> OCCUR						EACH OCCURRENCE	\$
	EXCESS LIAB <input type="checkbox"/> CLAIMS-MADE						AGGREGATE	\$
	DEDUCTIBLE							\$
	RETENTION \$							\$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY						<input type="checkbox"/> WC STATUTORY LIMITS <input type="checkbox"/> OTHER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH)	Y / N	N / A				E.L. EACH ACCIDENT	\$
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	\$
							E.L. DISEASE - POLICY LIMIT	\$

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

CERTIFICATE HOLDER Contractor's Name and Address	CANCELLATION SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.
	AUTHORIZED REPRESENTATIVE

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CERTIFICATE OF LIABILITY INSURANCE

OP ID: JF

DATE (MM/DD/YYYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER - - -	Phone:	CONTACT NAME:	
	Fax:	PHONE (A/C, No, Ext):	FAX (A/C, No):
		E-MAIL ADDRESS:	
		PRODUCER CUSTOMER ID #: _____	
		INSURER(S) AFFORDING COVERAGE	NAIC #
INSURED Contractor's Name and Address - -	INSURER A: INSURANCE COMPANY		AM BEST FINANCIAL
	INSURER B:		
	INSURER C:		
	INSURER D:		
	INSURER E:		
	INSURER F:		

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
-	GENERAL LIABILITY <input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR						EACH OCCURRENCE \$ 1,000,000 DAMAGE TO RENTED PREMISES (Ea occurrence) \$ 100,000 MED EXP (Any one person) \$ 5,000 PERSONAL & ADV INJURY \$ 1,000,000 GENERAL AGGREGATE \$ 2,000,000 PRODUCTS - COM/OP AGG \$ 2,000,000
-	AUTOMOBILE LIABILITY <input checked="" type="checkbox"/> ANY AUTO <input checked="" type="checkbox"/> ALL OWNED AUTOS <input checked="" type="checkbox"/> SCHEDULED AUTOS <input checked="" type="checkbox"/> HIRED AUTOS <input checked="" type="checkbox"/> NON-OWNED AUTOS						COMBINED SINGLE LIMIT (Ea accident) \$ 1,000,000 BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$
-	<input checked="" type="checkbox"/> UMBRELLA LIAB <input checked="" type="checkbox"/> OCCUR <input type="checkbox"/> EXCESS LIAB <input type="checkbox"/> CLAIMS-MADE						EACH OCCURRENCE \$ 2,000,000 AGGREGATE \$ 2,000,000
-	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) <input type="checkbox"/> Y / N <input checked="" type="checkbox"/> N / A If yes, describe under DESCRIPTION OF OPERATIONS below						<input checked="" type="checkbox"/> WC STATUTORY LIMITS <input type="checkbox"/> OTHER E.L. EACH ACCIDENT \$ 500,000 E.L. DISEASE - EA EMPLOYEE \$ 500,000 E.L. DISEASE - POLICY LIMIT \$ 500,000
-	Builder's Risk "ALL RISK" PROPERTY POLLUTION LIABILITY						CONTENTS Full Replacement Cost \$ 1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

Name of Additional Insured

CERTIFICATE HOLDER**CANCELLATION**

Owner's Name and Address	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.
	AUTHORIZED REPRESENTATIVE

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Sample Safety Plan Compliance Document (SPCD)
Gerald R. Ford International Airport
C-437 Natural Treatment System Improvements
2023-AGL-xxxx-NRA thru 2023-AGL-xxxx-NRA

I, , the General Contractor for the above noted project, have read the Construction Safety Phasing Plan for the above referenced project, and will abide by it as written and with the following additions, as noted:

1) Coordination

- A. The General contractor will have regularly scheduled meetings with the Airport Manager and with subcontractors to discuss safety and airport operations, during the entire project duration.
- B. Contractor shall provide updated construction schedule with each application for payment.
- C. No FAA ATO coordination is anticipated.

2) Phasing

- A. This project consists of essentially one phase, which consists of obstruction removal.
- B. Construction will take place daily, 6am-8pm, depending on project progress and weather conditions.
- C. Runway and Taxiway operations will not be affected by this project

3) Affected Areas

- A. Per CSPP

4) NAVAID Protection

- A. None needed. All construction activity takes place away from any NAVAID.

5) Contractor Access

- A. All contractor access will come from using existing public roadways and private airport perimeter roads.
- B. Gate access will be maintained secure. Contractor be vigilant of all non-normal activity and report same to Airport Manager, as soon as possible.

6) Wildlife Management

- A. Contractor shall report all wildlife sightings inside the airport perimeter to the Airport Management.

7) Foreign Object Debris Management-

- A. All food products and trash will be disposed of properly. Trash receptacles will be sealed and secured daily, to remove attraction of animals.

8) Dust Control

- A. Contractor shall utilize an approved dust control plan.

9) Hazardous Material Management

- A. No hazardous materials will be used in this construction project. If any situation were to develop, OSHA requirements for the items or situation will be followed.

10) Contractor-Construction Contacts

- A. —
- B. —
- C. Contractor shall follow emergency procedures outlined in their Safety Plan.
- D. ARFF coordination will be performed.
- E. FAA coordination will be through the Gerald R. Ford International Airport.
- F. All equipment to be used that is taller than the height requirements provided in the CSPP shall receive an approved airspace clearance prior to utilizing the equipment.
- G. No batch plants or associated airspacing are anticipated for this project.

11) Inspection Requirements

- A. General Contractor shall have a representative on site during all construction.
- B. Airport's consultant shall perform progress inspections.
- C. Airport's consultant, MDOT Aero, and Airport Management shall perform final inspection with Contractor per the schedule developed.

12) Underground Utilities

- A. Underground utilities shall be marked by the Miss Dig System.
- B. The Contractor is responsible for performing all necessary investigations and protection of existing underground utilities. Existing utilities were taken from plans of record. They have been shown to the extent known and are offered in good faith solely for informational purposes. They may not reflect actual locations and may not be all inclusive.
- C. Standard OSHA precautions shall be observed and practiced by all contractors.

13) Penalties

- A. Per CSPP

14) Special Conditions

- A. None Noted

15) Runway and Taxiway Visual Aids-

- A. This project does not involve lighting or signage.
- B. This project does not involve permanent or temporary markings.
- C. This project does not involve NAVAIDS.

16) Access Routes

- A. Construction route marking and signage will be provided as required. Contractor may provide marking or signage upon written approval from the Airport's consultant.

17) Hazard Marking and Lighting

- A. Construction site will be marked using conventional construction marking devices as required by local authorities.

18) Protection of runway and taxiway safety areas

- A. Runway safety areas are not impacted by this project.
- B. Runway object free areas are not impacted by this project.
- C. Taxiway safety areas are not impacted by this project.
- D. Taxiway object free areas are not impacted by this project.

- E. Obstacle free zones are not impacted by this project.
- F. Runway approach surfaces are not impacted by this project.
- G. No activity near taxiways will take place as part of this project.

Respectfully Submitted by

<Authorized Representative>
<Title>
<Contractor Name>

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Project Specifications

Owner: Gerald R. Ford International Airport Authority

Project Title: Natural Treatment System Improvements, Phase 1

Project #: C-437 (2250383)

1 TECHNICAL SPECIFICATIONS

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SECTION 01 22 00

UNIT PRICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 02, Division 32 and Division 40 Specification Sections, apply to this Section.

1.02 DEFINITIONS

- A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by Change Order, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.03 PROCEDURES

- A. Unit prices include all costs for material, labor, equipment, delivery, installation, insurance, and all other items necessary to complete the item as specified and shown on the drawings.
- B. Measurement and Payment: Upon completion of work involving unit prices, submit documentation to establish actual quantity of work provided. A Change Order will be issued in an amount equal to the actual quantity multiplied by the unit price.
- C. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.
- D. Cost for any work not specifically identified on Drawings C-100, C-101, C-103, C-202, C-203, C-204, C-210 and C-501 or Division 02, Division 32 and Division 40 Specification Sections shall be included into the unit price items identified in this section.
- E. Loss of material due to handling, stockpiling, washing, transfer or any other cause will not be paid. Cost for lost materials shall be included in the unit prices for each respective item of work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

- A. Unit Price: Volume Media (Bid Item #19)

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1. Description: Construction of proposed treatment system media. Refer to Sections 02 10 00 - Natural Treatment System and 02 94 10 – Treatment Media.
 2. Unit of Measurement: Cubic yard of Volume Media, compacted (as specified) in place.
- B. Unit Price: Top-Dressing Media (Bid Item #20)
1. Description: Installation of the top layer of expanded lightweight aggregate to as insulation for the Natural Treatment System. Refer to Sections 02 10 00 – Natural Treatment System and 02 90 10 – Treatment Media.
 2. Unit of Measurement: Cubic yard of Aggregate Insulation, compacted (as specified) in place.
- C. Unit Price: Course Media (Bid Item #21)
1. Description: Rock or cobble between 3-inches and 6-inches installed between the R-Tanks and excavation limits and other locations as shown on the drawings. Refer to Section 02 10 00, Natural Treatment System.
 2. Unit of Measurement: Cubic yard of Course Media, compacted (as specified) in place.
- D. Unit Price: Geotextile Fabric (Bid Item #22)
1. Description: Woven geotextile fabric installed as shown on the drawings. Refer to the drawings.
 2. Unit of Measurement: Square feet of Geotextile Fabric, along the ground, in place.
- E. Unit Price: Gabion Basket (Bid Item #23)
1. Description: Stainless Steel mesh basket to hold “Gabion 3” to 6” Rock”. Refer to Section 02 94 10, Treatment Media.
 2. Unit of Measurement: Lineal feet, regardless of width, of Gabion Basket, in place.
- F. Unit Price: Gabion 3" to 6" Rock (Bid Item #24)
1. Description: Rock or cobble between 3-inches and 6-inches installed inside gabion baskets as shown on the drawings. Refer to Section 02 94 10, Treatment Media.
 2. Unit of Measurement: Cubic yard of Gabion 3" to 6" Rock, compacted (as specified) in place.
- G. Unit Price: Splash Pad (Bid Item #25)
1. Description: Construction of 5-foot by 5-foot concrete, 6-inches thick, splash pads at the outlet of each of the distribution pipes as shown on the drawings.

Refer to Sections 02 10 00 – Natural Treatment System and 40 27 00 – Process Piping and Specialties.

2. Unit of Measurement: Each Splash Pad, constructed in place.

H. Unit Price: Piping (Bid Item #26)

1. Description: Piping within Cells 1E and 1F of the Natural Treatment System regardless of diameter or material. Refer to Sections 40 27 00 - Process Piping and Specialties, Section 40 27 02 – Process Valves and Operators, and Section 40 80 01 – Process Piping and Leakage Testing.
2. Unit of Measurement: Lineal feet of Piping, along the centerline of the pipe, from center of structure to center of structure, in place.

I. Unit Price: R-Tanks Mini (Bid Item #27)

1. Description: Fabricated water storage units with dimensions approximately 28.15-inches wide by 15.75-inches long by 9.45-inch height as shown in the drawings. Refer to Section 02 10 00, Natural Treatment System.
2. Unit of Measurement: Each R-Tank Mini, constructed in place.

J. Unit Price: R-Tanks HD Single (Bid Item #28)

1. Description: Fabricated water storage units with dimensions approximately 28.15-inches wide by 15.75-inches long by 17.32-inch height as shown in the drawings. All R-Tanks will be paid as “Single”. References to other combinations will be interpreted to be multiple “Single” units. Refer to Section 02 10 00, Natural Treatment System.
2. Unit of Measurement: Each R-Tank Single, constructed in place.

K. Unit Price: Media Removal (Bid Item #29)

1. Description: Excavation of existing treatment system soils, transportation to on-airport soil disposal area, placing and compacting soil in disposal area, separation of other pay items from the soil media and preparation of existing soils for placement of other materials. Refer to Sections 02 10 00 - Natural Treatment System and 02 41 00 – Demolition.
2. Unit of Measurement: Cubic yard of Media Removal, as measured from the existing surface to the bottom of the excavation.

L. Unit Price: Piping Removal (Bid Item #30)

1. Description: Removal and disposal, off-airport property, of existing infiltrator. Refer to Section 02 41 00, Demolition.
2. Unit of Measurement: Lineal feet of Piping Removal, along the centerline of the pipe, from end (or removal limits) to end, in place.

M. Unit Price: Infiltrator Removal (Bid Item #31)

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1. Description: Removal and disposal, off-airport property, of existing 52" x 34" (approximate) infiltrator sections. Refer to Section 02 41 00, Demolition.
 2. Unit of Measurement: Each Infiltrator removed.
- N. Unit Price: Smart Drain (Bid Item #32)
1. Description: Fabricated Water Level Control System. Refer to Section 02 10 00, Natural Treatment System.
 2. Unit of Measurement: Each Smart Drain, constructed in place.

END OF SECTION

**SECTION 02 10 00
NATURAL TREATMENT SYSTEM**

PART 1 GENERAL

1.01 DESCRIPTION

- A. This item shall consist of the construction and startup of the two natural treatment systems (NTS) beds (including miscellaneous concrete items, distribution piping, collector piping, and appurtenant piping, inline water level control structures, and R-Tank stormwater modules) in accordance with these specifications and as shown on the Drawings.

1.02 SUBMITTALS

- A. Fabricated Water Level Control Structures:
 - 1. Shop Drawings:
 - a. Make, model, weight, and dimensions of each unit.
 - b. Manufacturer's catalog information, descriptive literature, specifications, and identification of materials of construction.
 - c. Detailed Structural and Mechanical Drawings showing the unit fabrications, including stoplogs and weir. Include dimensions, size, elevations and locations of connections to piping.
 - 2. Quality Control Submittals:
 - a. Manufacturer's Certificate of Compliance.
 - b. Special shipping, storage and protection, and handling instructions.
 - c. Manufacturer's written/printed installation instructions.
 - d. Operation and maintenance manual.

- B. R-Tank Stormwater Modules:
 - 1. Shop Drawings:
 - a. Make, model, weight, and dimensions of each unit.
 - b. Manufacturer's catalog information, descriptive literature, specifications, and identification of materials of construction.
 - 2. Quality Control Submittals:
 - a. Manufacturer's Certificate of Compliance.
 - b. Special shipping, storage and protection, and handling instructions.
 - c. Manufacturer's written/printed installation instructions.
 - d. Operation and maintenance manual.

C. Measurement and Payment

1. The measurement for natural treatment system shall be unit cost.
2. Payment will be made at the Contract unit cost price for all components of the NTS system and related structures. This price shall fully compensate the Contractor for furnishing all materials and for all preparation, excavation, and installation of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

1.03 MATERIAL REQUIREMENTS

- A. American Association of State Highway and Transportation Officials (AASHTO): M 252, High Density Polyethylene Drainage Tubing (all types).
- B. ASTM International (ASTM):
1. A240, Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 2. A276, Stainless Steel Bars and Shapes.
 3. B209, Aluminum and Aluminum-Alloy Sheet and Plate.
 4. B308, Aluminum-Alloy 6061-T6 Standard Structural Profiles.

PART 2 PRODUCTS

2.01 GENERAL

- A. Materials shall meet the requirements shown on the Drawings and specified below.

2.02 FABRICATED WATER LEVEL CONTROL STRUCTURE

- A. Materials:
1. Aluminum Plate and Shapes: ASTM B209 and B308, Alloy 6061-T6.
 2. Stainless Steel:
 - a. Plate, Sheet, and Strip: ASTM A240, Type 316L.
 - b. Bars and Shapes: ASTM A276, Type 316L.
- B. Water level control structures: The level control structure shall be Smart Drain™ unit constructed by Agri-Drain. Total unit length shall be 8-feet and shall be set immediately on top of the liner. The unit shall be held securely in place by coarse aggregate or fastened securely to the R-Tanks. The unit shall draw directly from the R-Tanks and discharge to the pipe stub in the bed upstream of the current level control structure. All stop logs shall be removed from the current level control structure, but provided to the Owner.

C. Multi-Level Automated Remote-Control Valve:

1. Agri-Drain system shall include a power and control unit system that is comprised of a solar panel, battery, controller, and weather-proof enclosure to operate the power actuator.
2. Smart Drainage System shall include one power actuator to open and close the slide gate valve in a two-level structure. The structure will have a two-level valve installed with the slide gate valve detailed in the Drawings covered by manual stoplogs.
3. Power actuator:
 - a. Material: all aluminum frame and extension tube.
 - b. Input voltage: 12V dc, 24V dc.
 - c. Dynamic load range: 34 lbs to 225 lbs.
 - d. Maximum static load: 562 lbs.
 - e. Standard present limit switches at both ends of stroke.
 - f. Accessories:
 - 1) Mounting brackets.
 - 2) Direction reversing switches.
 - 3) Wired and wireless controllers.
 - 4) Direction reversing relays.

D. Smart Drain System Operating Protocols:

1. Primary operating protocol is based on a set water level elevation that triggers the actuated valve to open for a set period of time. The water level elevation trigger and the period of time for the valve to open shall be changeable from offsite remote Web site program during startup and normal operations of the system.
2. Secondary operating protocol is based on a set time from last valve opening instead of an elevation based action. Programming of the controller will trigger secondary operating protocol if the water level does not trigger the primary operating protocol regularly. The Contractor to coordinate programming with the manufacturer to include the following on the screen of the onsite controller:
 - a. Visualization of the parameter showing amount of time between openings.
 - b. Option to change the amount of time between openings in hours.

2.03 R-TANK STORMWATER MODULE

A. Materials:

1. Heavy-Duty (HD) Single Module:
 - a. Height: 17.32 inches.
 - b. Length: 28.15 inches.

- c. Width: 15.75 inches.
 - d. Void Area: Internal 95 percent and surface area of 90 percent.
 - e. Vertical compressive strength: 33.4 psi.
 - f. Recycled Content: 100 percent recycled polypropylene.
2. Heavy-Duty Mini (HD-Mini) Module:
- a. Height: 9.45 inches.
 - b. Length: 28.15 inches.
 - c. Width: 15.75 inches.
 - d. Void Area: Internal 95 percent and surface area of 90 percent.
 - e. Vertical compressive strength: 33.4 psi.
 - f. Recycled Content: 100 percent recycled polypropylene.
- B. Stormwater Modules: The stormwater modules shall be constructed of recycled polypropylene designed with 90 percent surface area void available for infiltration and 95 percent void area for treated water collection and transfer.
- C. The Contractor is responsible for properly securing the R-Tank modules in place per the manufacturer's recommendations.
- D. Geotextile: An 8-ounce geotextile will be installed below and above the stormwater modules to prevent material from entering into the void area. Geotextile will be installed as shown on the Drawings. No geotextile will be installed on either side of the stormwater modules. Any geotextile found to be on the side of the stormwater media will require removal by the Contractor. Geotextile shall also be installed over the gabions to prevent surface media from falling into the void area of the gabions. No geotextile shall be placed on top of treatment media.

2.04 VEGETATIVE COVER

- A. All vegetative cover shall conform to the requirements of Section 32 92 00, Turf and Grasses.
- B. Quality Assurance:
1. General: The Contractor shall supply all shipping materials, equipment, tools, tarps, and incidentals necessary to complete the work and all materials shall be subject to approval by the Engineer. Specialized tools or tool configurations may be required, as specified on the Drawings or in the Bid Documents.
 2. Inspection: The Contractor shall be responsible for all certificates of inspection of seed materials that may be required by federal, state, or other authorities to accompany shipments of plants. The Engineer reserves the right to inspect and reject seeding materials at the source of supply and upon arrival at the Job Site.

3. Substitutions: The Contractor shall make every reasonable effort to find the seed materials specified by the Engineer. The Contractor should be aware that more than one vendor may be required to obtain all the necessary seed materials. If the Contractor is unable to obtain substitute seed materials, the Contractor shall inform the Engineer in writing with the cause of the acquisition problem(s) and a list of vendors contacted. Suggestions concerning other appropriate substitutions may be included with this correspondence; however, all substitutions must be approved in writing by the Engineer prior to finalizing seed material purchase orders.

C. Miscellaneous Materials:

1. Materials Transport: The Contractor shall have a sufficient number of vehicles with the capability to transport the materials and efficiently supply the planting crews with planting material.

PART 3 EXECUTION

3.01 GENERAL

- A. The construction of the NTS beds requires that the Contractor comply with the methods and sequence of construction, as specified below and in the Drawings. Alternative methods, materials, and sequences must be approved by the Engineer.

3.02 FABRICATED WATER LEVEL CONTROL STRUCTURE (AGRI-DRAIN)

- A. Site Preparation: All Site work, excluding piping placement, within 10 feet of the structure shall be completed before the installation of the structure is performed. Contractor shall determine the appropriate location to get the R-Tanks securely fastened around the Agri-Drain.
- B. Installation:
 1. Structure shall be placed plumb at elevation as shown on the Drawings. No torquing of structure shall be allowed in final placement.
 2. Piping shall be connected to the structure using the rubber couplers. Vertical alignment of structure shall be tested by inserting and removing a 7-inch stoplog to the bottom of the structure. If binding of stoplog occurs, structure alignment shall be adjusted, such that stoplogs can be inserted and removed without binding. Once non-binding conditions of stoplog is verified, lid shall be attached to the structure.

3.03 R-TANK STORMWATER MODULE

- A. Site Preparation: The geomembrane will be installed below the stormwater modules before installation begins.
- B. Installation:
 - 1. R-tank stormwater modules shall be assembled prior to installation in the treatment system per manufacturer's guidelines and recommendations.
 - 2. R-Tank stormwater modules shall be installed per the manufacturer's recommended installation guide. Occasional minor gaps or variation in the height of between units (less than 1/2-inches) are acceptable, but reasonable efforts should be made to minimize these variations. If gaps or height variations persist through three or more adjacent units, remove the modules and repair the base.
 - 3. A single HD unit and a single HD-Mini unit will be stacked to achieve the desired treatment system height and void area necessary to drain the system effectively. Stacking and location of the R-tanks shall be installed as shown on the Drawings and per direction of the manufacturer. Stormwater modules shall be installed only at the base of the treatment system and not up the berm slopes.
 - 4. Coarse media, as described in Section 02 94 10, Treatment Media, shall be installed on the side of the stormwater modules between the stormwater modules and the berms.
 - 5. Place the geotextile, as shown on the Drawings, at the top of the R-Tank stormwater modules to prevent media from falling into the stormwater modules. Do not install geotextile on the sides of the R-Tank stormwater modules.

3.04 SEEDING

- A. The Contractor shall not seed an NTS until bed media is fully accepted by the Engineer and water distribution and collection system and outlet control structure is installed and shown to operate as intended. The Contractor shall prepare the NTS for seeding per requirements of Section 32 92 00, Turf and Grasses.

3.05 CONSTRUCTION SEQUENCING PLAN

- A. Before starting construction, the Contractor shall submit a construction schedule showing the proposed order of work and indicate the anticipated completion time of the work items. The schedule shall be a definitive account of the work that is to be accomplished within the time indicated and shall be updated weekly to reflect actual work progress. In the event that the proposed schedule does not meet the schedule criteria set forth by the Engineer, the Contractor shall resubmit a revised schedule for approval. The construction schedule shall be utilized as a sequencing reference for the progress of construction operations and may, at the sole discretion of the Engineer, be employed by the Engineer in determining delays and time extensions but does not become a part of the Contract.
- B. The Contractor shall make no change in the construction schedule at any time, without prior approval of the Engineer. Notify the Engineer immediately of conflicts requiring schedule review.
- C. The Engineer's review of schedule shall not imply changes in Contract for services. The Contractor is responsible to notify the Engineer of Contract Implications or changes that arise from alterations of construction schedule.

END SECTION

**SECTION 02 41 00
DEMOLITION**

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this Section:
1. American National Standards Institute (ANSI): A10.6, Safety Requirements for Demolition Operations.
 2. Occupational Safety and Health Administration (OSHA), U.S. Code of Federal Regulations (CFR) Title 29 Part 1926—Occupational Safety and Health Regulations for Construction.
 3. Environmental Protection Agency (EPA), U.S. Code of Federal Regulations (CFR), Title 40:
 - a. Part 61—National Emission Standards for Hazardous Air Pollutants.
 - b. Part 82—Protection of Stratospheric Ozone.
 - c. Part 273—Standards for Universal Waste Management.

1.02 DEFINITIONS

- A. Demolition: Includes removal of pipes, manholes tanks, conduit, and other underground facilities, whether as a separate activity or in conjunction with construction of new facilities.
- B. Modify: Provide all necessary material and labor to modify an existing item to the condition indicated or specified.
- C. Relocate: Remove, protect, clean and reinstall equipment, including electrical, instrumentation, and all ancillary components required to make the equipment fully functional, to the new location identified on the Drawings.
- D. Salvage/Salvageable: Remove and deliver, to the specified location(s), the equipment, materials, or other items so identified to be saved from destruction, damage, or waste; such property to remain that of the Owner. Unless otherwise specified, title to items identified for demolition shall revert to the Contractor.

1.03 SUBMITTALS

- A. Informational Submittals:
1. Submit proposed demolition, in accordance with requirements specified herein, for approval before such Work is started.

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2. Submit copies of any notifications, authorizations and permits required to perform the Work.

1.04 REGULATORY AND SAFETY REQUIREMENTS

- A. When applicable, demolition Work shall be accomplished in strict accordance with 29 CFR 1926-Subpart T.
- B. Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the General Conditions, Contractor's safety requirements shall conform to ANSI A10.6.
- C. Furnish timely notification of this demolition project to applicable federal, state, regional, and local authorities in accordance with 40 CFR 61-Subpart M.

1.05 SEQUENCING AND SCHEDULING

- A. Include the Work of this specification in the progress schedule, as specified in Section 01 32 00, Construction Progress Documentation.
- B. Areas in which the Work is to be accomplished will be available in accordance with the following schedule:
 1. Stage 2 Cells E and F.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EXISTING FACILITIES TO BE DEMOLISHED OR RENOVATED

- A. Utilities and Related Equipment:
 1. Remove existing utilities as indicated and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Engineer.
 2. When utility lines are encountered that are not indicated on the Drawings, notify the Owner prior to further work in that area.
- B. Paving and Slabs: Remove concrete and asphaltic concrete paving and slabs as indicated. Provide neat sawcuts at limits of pavement removal as indicated.

3.02 PROTECTION

- A. Dust and Debris Control: Sweep pavements as often as necessary to control the spread of debris that may result in foreign object damage potential to vehicular traffic.

- B. Traffic Control Signs: Where pedestrian and driver safety is endangered in the area of removal Work, use traffic barricades with flashing lights.
- C. Existing Work:
 - 1. Survey the Site and examine the Drawings and specifications to determine the extent of the Work before beginning any demolition or renovation.
 - 2. Take necessary precautions to avoid damage to existing items scheduled to remain in place, to be reused, or to remain the property of the Owner; any Contractor-damaged items shall be repaired or replaced as directed by the Engineer.
 - 3. Ensure that structural elements are not overloaded as a result of or during performance of the Work. Responsibility for additional structural elements or increasing the strength of existing structural elements as may be required as a result of any Work performed under this Contract shall be that of the Contractor. Repairs, reinforcement, or structural replacement must have the Engineer approval.
 - 4. Do not overload pavements to remain.
- D. Trees: Protect trees within the Site that might be damaged during demolition and are indicated to be left in place, by a 6-foot-high fence. The fence shall be securely erected a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Any tree designated to remain that is damaged during the Work shall be replaced in kind, as approved by the Engineer.
- E. Facilities:
 - 1. Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities.
 - 2. Protect all facility elements not scheduled for demolition.
- F. Protection of Personnel:
 - 1. During demolition, continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the demolition site.
 - 2. Provide temporary barricades and other forms of protection to protect the Owner's personnel and the general public from injury due to demolition Work.

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3.03 BURNING

- A. The use of burning at the Site for the disposal of refuse and debris will not be permitted.

3.04 RELOCATIONS

- A. Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Clean all items to be relocated prior to reinstallation, to the satisfaction of the Engineer. Repair items to be relocated which are damaged or replace damaged items with new undamaged items as approved by the Engineer.

3.05 BACKFILL

- A. Do not use demolition debris as backfill material.

3.06 TITLE TO MATERIALS

- A. All salvaged equipment and materials will remain the property of the Owner.
- B. With the exception of the following listed salvaged equipment and materials, all items designated to be removed shall become the property of the Contractor:

3.07 DISPOSITION OF MATERIAL

- A. Salvage equipment and material to the maximum extent possible.
- B. Remove materials and equipment that are indicated to be removed by the Contractor and deliver to a storage site as directed.
- C. Remove salvaged items in a manner to prevent damage, and pack or crate to protect the items from damage while in storage or during shipment. Properly identify containers as to contents.
- D. Repair or replace, at the discretion of the Engineer, items damaged during removal or storage.
- E. Remove salvaged items designated as the property of the Owner in a manner to prevent damage, and pack or crate to protect the items from damage while in storage or during shipment. Properly identify containers as to contents.
- F. Repair or replace, at the discretion of the Engineer, items damaged during removal or storage.
- G. Deliver salvaged items that are designated as the property of the Owner to a storage site as directed on the Site.

- H. The Owner will not be responsible for the condition or loss of, or damage to, property scheduled to become the Contractor's property after the Engineer's authorization to begin demolition. Materials and equipment shall not be viewed by prospective purchasers or sold on the Site.
- I. The Owner will not be responsible for the condition or loss of, or damage to, such property after the Engineer's authorization to begin demolition.
- J. Store salvaged items as approved by the Engineer and remove them from the Owner's property before completion of the Contract. Materials and equipment shall not be either viewed by prospective purchasers or sold on the Site.

3.08 REUSE OF MATERIALS AND EQUIPMENT

- A. Properly store and maintain equipment and materials in same condition as when removed.
- B. Store equipment and material designated to be reused in a location designated by the Owner.
- C. Equipment and material designated to be reused shall be cleaned, serviced and checked for proper operability before being put back into service.
- D. The Engineer will determine condition of equipment and materials prior to removal.

3.09 SPECIALIZED SALVAGE

- A. Historical Items: Remove in a manner to prevent damage.

3.10 UNSALVAGEABLE MATERIAL

- A. Concrete, masonry, and other noncombustible material, except concrete permitted to remain in place, shall be disposed of in the following manner and location.
 - 1. Designated by the Owner.

- B. Combustible material shall be disposed of off the Site.

3.11 CLEANUP

- A. Debris and rubbish shall be removed from excavations. Debris and rubbish shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

END OF SECTION

**SECTION 02 94 10
TREATMENT MEDIA**

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. This Work shall consist of procuring materials, material blending, testing, and placement of the aggregate media into the rehabilitated treatment cells intended to provide water quality treatment of surface water runoff and deicing fluid from the Gerald R. Ford International Airport (GFIA) as shown on the Drawings. The Work included in this section consists of the following:
1. Aggregate media material acquisition.
 2. Testing and analysis for specification conformance.
 3. Preparation of aggregate media mix and testing for conformance.
 4. Installation and placement of aggregate media.
 5. Final in-place testing of aggregate media.
 6. Clean-up.
- B. Definitions:
1. Top-Dressing Media: Expanded lightweight aggregate to insulate treatment system.
 2. Treatment Media: A homogeneous washed aggregate media free of fines used for the treatment of stormwater and deicing fluid.
 3. Coarse Media: Washed aggregate media free of fines used to fill the area between R-tanks and cell berms, and between the ends of the gabion course and berms.
- C. Qualifications and Quality Assurance:
1. Analysis and Testing of Materials Qualifications: For each type of packaged material required for the Work of this section, provide manufacturer's certified analysis. For all other materials, provide complete analysis by a recognized laboratory made in strict compliance with the standards and procedures of the following:
 - a. American Society of Testing Materials (ASTM).
 - b. American Association of State Highway and Transportation Officials (AASHTO).
 - c. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).

2. Quality Assurance Qualifications: Work and materials shall meet the standards of the following references:
 - a. American Society for Testing Materials (ASTM).
 - b. American Association of State Highway and Transportation Officials (AASHTO).
 - c. Environmental Protection Agency (EPA).
 - d. Code of Federal Regulations (CFR) – 40 CFR Part 261 Subpart C.
 - e. Michigan Department of Transportation (MDOT).
 - f. Michigan Department of Environment, Great Lakes, and Energy (EGLE).
3. Installer Qualifications: A qualified installer whose work has resulted in successful installation of filter media systems.
 - a. Installer’s Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project Site who has at least 5 years’ experience with projects of similar scale and complexity.
 - b. The Contractor shall have experience in the proper and safe transportation and installation of filter media material.
 - c. The Contractor shall have adequate supervision, staff, equipment and experience needed to complete a project of this magnitude.
 - d. The Contractor shall prepare and present to the Engineer required media material submittals, and their associated specified test results at an absolute minimum of 2 weeks prior to the scheduled Treatment Media, Top-Dressing Media and Coarse Media installation.
 - e. The Contractor shall have at least 3 to 5 years’ experience in installing media.
4. Media Mixing Contractor Qualifications:
 - a. Shall be able to provide aggregate media mixes that meet the specifications within tolerances assigned. Treatment Media and all ingredients should be both stored in a way that prevents foreign material from entering the washed media. Treatment Media should be screened and blended with a 1/2–inch minus trommel screen for optimum uniformity.
 - b. Shall be able to produce enough consistently uniform Treatment Media material for the Project to meet the scheduled demands.
 - c. The Treatment Media blending vendor/contractor shall have at least 3 to 5 years of aggregate media blending experience. The blending shall occur within 150 miles of GFIA.
5. Testing Laboratory Qualifications: An independent, state-operated, or university-operated laboratory; experienced in aggregate media testing; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.
 - a. Employ a qualified independent testing and inspection laboratory acceptable to the Engineer and Owner to perform tests and certifications indicated. Alternative agencies must be submitted to the Engineer for approval prior to use.

- b. It is the responsibility of the Contractor in conjunction with the Treatment Media, Top-Dressing Media, and Coarse Media Supplier to submit materials for the tests.
- c. Tests shall be made in strict compliance with the standards of the Association of Official Analytical Chemists and follow standards from ASTM, ASHTO, EPA, and/or Methods of Soil Analysis.

D. Pre-installation Meetings:

- 1. Pre-installation conference: Conduct conference at the Project Site prior to commencement of construction activities with the Engineer and the Owner.
- 2. All submittals, testing, and materials shall be completed and approved by the Engineer prior to the pre-installation conference.

E. Submittals and Testing:

- 1. Sampling, Testing and Acceptance:
 - a. General: Perform tests on the media samples according to requirements in this article. Only media conforming to specifications stated herein shall be permitted to be used by the Contractor.
 - b. Sampling: Samples will be taken of any stockpiled media per requirements of the *Procedures for Aggregate Inspection* manual produced by MDOT, latest version available.
 - c. Testing: All composite samples shall have a sieve analysis performed in accordance with ASTM C136 to determine d10, UC, percent fines, and gradation of the specified media. Sieve analyses shall be performed by an independent materials testing laboratory acceptable to the Engineer. This should not constrain the Contractor from performing additional sieve analyses at the production site to ensure good quality control. The Contractor shall pay for testing composite samples specified herein. Retesting of material that had been previously rejected or additional QA/QC testing performed by the Supplier shall also be paid for by the Contractor. The first composite sample shall also be analyzed for specific gravity in accordance with ASTM C127. These analyses shall be performed by an independent materials testing laboratory acceptable to the Engineer. In lieu of an independent testing laboratory, the Engineer may allow testing to be completed by the Supplier's laboratory. The Contractor shall pay for these tests. Retesting of material that had previously been rejected shall also be paid for by the Contractor.

- d. Water Quality Testing in accordance with Section III C must be completed for each and every delivery of Treatment media, Top Dressing Media, and Coarse Media. The Contractor shall provide two 5-gallon representative samples for each truck delivered.
 - e. Acceptance and Rejection: Materials that have been prequalified and passed each and every part of the applicable requirements of this section, as verified by the Engineer, will be allowed to be hauled to the Construction Site for placement in preparation for construction of the media beds. No material shall be hauled to the Site that have not been verified as having passed all testing criteria. Should a run of material fail to meet all applicable requirements, the Contractor may, upon approval from the Engineer, reprocess the material in question to meet the specifications. Retesting of such material shall be required and shall be the sole responsibility of the Contractor.
 - f. Materials that have been improperly handled or stockpiled, as per the specifications will be rejected and not paid for by the Owner.
2. At least 10 working days prior to blending of each media, the Contractor shall submit to the Engineer the following data. These data are required even if using pre-approved material. The dates of the tests shall be within 45 days of blending and be taken from the same stockpile, batch or source as will be used in the blending. All testing shall be by a certified laboratory.
- a. Treatment Media Product Data and Testing:
 - 1) Source certificate or manufacturer cut sheet showing the source for and description of the material.
 - 2) Grain Size Analysis and Coefficient of Uniformity (Cu) results performed by an independent certified laboratory in accordance with ASTM D422, Standard Test Method for Particle-Size Analysis of Soils for at least the sieves shown in descriptions in Section II B.1.
 - 3) Material density in lbs./CF or lbs./CY.
 - 4) The Grain Size Analysis and Coefficient of Uniformity (Cu) testing shall be performed on the washed Treatment Media at least once for every 50 CY of media produced.
 - b. Top-Dressing Media Product Data and Testing:
 - 1) Include recommendations for application and use.
 - 2) Include test data substantiating that products comply with requirements.
 - 3) Include sieve analyses for media materials.
 - 4) Include test data substantiating insulating rating to comply with requirements.

- c. Coarse Media Product Data and Testing:
 - 1) Include recommendations for application and use.
 - 2) Include test data substantiating that products comply with requirements.
 - 3) Include sieve analyses for media materials.
 - 4) Include test data substantiating insulating rating to comply with requirements.
 - d. Material Certificates: For each type of imported media before delivery to the Site, according to the following:
 - 1) Manufacturer's qualified testing agency's certified analysis of standard products.
 - 2) Analysis of nonstandard materials, by a qualified testing agency.
3. Information Submittals:
- a. The Contractor must submit a “Media Blending, Delivery, Protection, and Placement Plan”. The submittal must be approved by the Engineer prior to any blending of the Treatment Media.
 - b. Qualification Data: For each testing agency.
 - c. Laboratory Information: Include the following information for the laboratories used for the material testing:
 - 1) Name of Lab.
 - 2) Address.
 - 3) Phone Number.
 - 4) Contact person with email.
 - 5) Date of current certification by ASTM, AASHTO, MDOT, or EGLE.
 - d. Field quality-control reports.
- F. Delivery, Storage and Handling:
- 1. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws, if applicable.
 - 2. Bulk Materials:
 - a. Do not dump or store bulk materials near structures, utilities, walkways and pavement, or on existing turf areas or plants outside of the designated stockpile area.
 - b. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - c. Do not move or handle materials when they are wet or frozen.
 - 3. Hauling Materials:
 - a. Do not haul over surfacing in process of construction.
 - b. Loads: Of uniform capacity.

- c. Maintain consistent gradation of material delivered; loads of widely varying gradations will be cause for rejection.
 - d. Hauling of accepted media from the point of production to the construction site shall be in trucks with cleaned beds free of any other material that are being used for no other purpose than to transport Treatment Media, Top-Dressing Media, or Coarse Media. Trucks that have been hauling other rock or sand materials shall be thoroughly washed prior to loading with media.
 - e. Under no circumstances shall loaders and trucks that have been used to haul dirt, sludge, debris, stumps, vegetative, or other organic-based materials be allowed to haul Treatment Media, Top-Dressing Media, or Coarse Media, unless approved by the Engineer. The Engineer may elect to allow loaders/trucks which have hauled such material to be used, provided that the truckbed is thoroughly washed and cleaned to the Engineer's satisfaction.
 - f. Should a load of material be delivered to the Site by the Supplier in a truckbed that does not meet the above criteria, the entire load will be rejected and shall be removed immediately. The Contractor shall bear all costs associated with removal. Any and all rejected material shall not be used even after reprocessing/washing.
 - g. Trucks hauling specified media to the Construction Site shall follow specific traffic routes to help preclude excessive pickup of foreign materials that may contaminate the specified media. The traffic routes will be established by the Contractor and favorable reviewed by the Owner or Engineer.
 - h. Temporary stockpiling of Treatment Media, Top-Dressing Media, or Coarse Media will be allowed only if material is covered and kept clean from other site debris. The stockpile areas shall be well drained and sloped and bermed as necessary to preclude contact with storm runoff and drainage from other material stockpiles and equipment areas. To the maximum extent practicable, stockpiles shall be placed so as to avoid contamination from vehicles, stationary equipment, and excessive dust or other airborne contaminants.
 - i. The Contractor shall clearly delineate and identify all specified media stockpiling areas onsite.
4. Handling and Spreading Materials:
- a. Distribute material to provide required density, depth, grade, and dimensions with allowance for subsequent lifts.
 - b. Produce even distribution of material upon roadway or prepared surface without segregation.
 - c. Use low ground pressure spreading equipment with a maximum ground pressure of 5 psi.

PART 2 PRODUCTS

A. Treatment Media

1. Treatment Media shall be mineral aggregate and meet the gradation requirements below and be thoroughly cleaned and free of dirt, clay, silt, asphalt, organic material, or other foreign matter and all aggregate passing the No. 4 sieve size. Treatment Media is described as MDOT 17A aggregate with a final washing screening over a 3/8-inch screen. The following treatment media description meets MDOT 17A for all categories except No. 8 where standard gradation allows up to 8 percent passing.

US Sieve Size	Sieve Size (mm)	Percent Passing by Weight
1-inch	25.0	100
3/4-inch	19.0	90-100
1/2-inch	12.5	50-75
No. 4	4.75	<0.5*

*Note: No. 4 gradation is stricter percent passing than MDOT 17A.

2. Treatment Media shall be thoroughly washed and free of dirt, clay, silt, asphalt, organic material, or other foreign matter.
3. Treatment Media shall be free of fines determined by turbidity. Water passing through Treatment Media shall meet the following standards or less:
 - a. One gallon of water (4 liters) shall be no more turbid than 100 nephelometric turbidity units (NTU) to meet specification.

B. Top-Dressing Media:

1. Top-Dressing Media shall be expanded lightweight aggregate manufactured to meet ASTM C330 standards including, but not limited to, Norlite™ or Stalite™ and meet the gradation requirements below.

US Sieve Size	Sieve Size (mm)	Percent Passing by Weight
1/2-inch	12.5	100
3/8-inch	9.5	80-100
No. 4	4.75	5-40
No. 8	2.36	0-20

2. Top-Dressing Media shall be thoroughly washed and free of dirt, clay, silt, asphalt, organic material, or other foreign matter.
3. Top-Dressing Media shall be free of fines determined by turbidity. Water passing through Treatment Media shall meet the following standards or less:
 - a. One gallon of water (4 liters) shall be no more turbid than 100 nephelometric turbidity units (NTU) to meet specification.
4. Top-Dressing Media shall have an insulating rating of R-1 to R-2 per inch per ASHRAE 90.1 standards.

C. Coarse Media:

1. Coarse Media shall be rock or cobble and be between 3 and 6 inch according to AASHTO No. 1 standards and be thoroughly cleaned and free of dirt, clay, silt, asphalt, organic material, or other foreign matter and all aggregate passing the No. 4 sieve size.
2. Coarse Media shall be free of fines determined by turbidity. Water passing through Coarse Media shall meet the following standards or less
 - a. One gallons of water (4 liters) shall be no more turbid than 100 nephelometric turbidity units (NTU) to meet specification

PART 3 EXECUTION

A. General:

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, asphalt/concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, solid waste, or acid has been deposited in the Treatment Media, Top-Dressing Media or Coarse Media.
2. Proceed with placement only after unsatisfactory conditions have been corrected and approved by the Engineer.
3. Finish Grading: Grade Top-Dressing Media, Treatment Media, and Coarse Media to a loose, uniform surface plane as smooth as media size will allow. Do not compact media. Roll and rake, remove ridges, and fill depressions to meet finish grades.

B. Equipment:

1. Non-compacting Equipment: Contractor shall use equipment that prevents compaction of the media and, if required to travel over the media, shall not exceed 5 psi loading ground pressure.

C. Washing Media Prior to Install:

1. Contractor shall wash filter prior to installation. All media shall receive at least two separate washings and wash water must achieve a turbidity that is visibly clear and meet the specifications described herein. All media must be inspected by the Engineer for final approval. Media washing includes simultaneous application of water and mechanical agitation of the media to dislodge and wash out particles. Additional washings may be necessary to achieve water clarity criteria. These steps are necessary to prevent particulates from accumulating and clogging media pore spaces, thereby reducing effectiveness and function of the treatment system.

D. Construction Courses:

1. Media (all sizes):
 - a. Maximum Completed Lift Thickness: 6 inches for treatment media and surface media, 12 inches for coarse media.
 - b. Completed Course Total Thickness: As shown on the Drawings.
 - c. Spread lift on preceding course to required cross-section.
 - d. Blade or broom surface to maintain true line, grade, and cross-section.
 - e. Contractor shall use means of course construction that do not exceed 5 psi loading ground pressure.

E. Protection:

1. Protect areas of in-place media from compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
 - a. Storage of construction materials, debris, or excavated material.
 - b. Parking vehicles or equipment.
 - c. Vehicle traffic.
 - d. Foot traffic.
 - e. Impoundment of water.
 - f. Excavation or other digging unless otherwise indicated.
 - g. Divert stormwater runoff from in-place media until vegetation is established or other adequate stabilization is in place. Engineer approval required.
2. If either media is compacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the media and contamination; restore the subgrade as directed by Engineer and replace contaminated Treatment Media, Top-Dressing Media, or Coarse Media with new media.

F. Cleaning:

1. Protect areas adjacent to media preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.
2. Remove surplus media and waste material including excess media, unsuitable materials, trash, and debris and legally dispose of them off the Owner's property unless otherwise indicated.
 - a. Dispose of excess subsoil, media, and unsuitable materials onsite where directed by the Owner.

END OF SECTION

**SECTION 32 92 00
TURF AND GRASSES**

PART 1 GENERAL

1.01 DEFINITIONS

- A. Maintenance Period: A dormant seed method shall be used. Seeding will occur after November 15th. Success of seeding will be evaluated in mid-June between June 10th and June 20th of the following year. Additional seeding by end of June will be necessary if seeding performance is not satisfactory.
- B. Satisfactory Stand: Grass or section of grass of 10,000 square feet or larger that has:
 - 1. No bare spots (devoid of shoots for seeding) larger than 10 square feet.
 - 2. Not more than 10 percent of total area with bare spots larger than 3 square feet.

1.02 SUBMITTALS

- A. Action Submittals: Product labels/data sheets.
- B. Informational Submittals:
 - 1. Seed: Certification of seed analysis, germination rate, and inoculation:
 - a. Certify that each lot of seed has been tested by a testing laboratory certified in seed testing, within 6 months of date of delivery. Include with certification:
 - 1) Name and address of laboratory.
 - 2) Date of test.
 - 3) Lot number for each seed specified.
 - 4) Test Results: (i) name, (ii) percentages of purity and of germination, and (iii) weed content for each kind of seed furnished.
 - b. Mixtures: Proportions of each kind of seed.

1.03 DELIVERY, STORAGE, AND PROTECTION

- A. Seed:
 - 1. Furnish in standard containers with seed name, lot number, net weight, percentages of purity, germination, and hard seed and maximum weed seed content, clearly marked for each container of seed.
 - 2. Keep dry during storage.

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- B. Sod: NA.
- C. Hydroseeding Mulch: Mark package of wood fiber mulch to show air dry weight.

1.04 WEATHER RESTRICTIONS

- A. Perform Work under favorable weather and soil moisture conditions for dormant seeding methods as determined by accepted local practice.

1.05 SEQUENCING AND SCHEDULING

- A. Complete Work under this section within 3 days.
- B. Notify Engineer at least 3 days in advance of seeding.
- C. Planting Season: Dormant seeding after November 15th. Reseeding by July 1.

1.06 MAINTENANCE SERVICE

- A. Contractor: Perform maintenance operations during maintenance period to include:
 - 1. Watering: NA.
 - 2. Washouts: NA.
 - 3. Mulch: NA.
 - 4. Mowing: NA.
 - 5. Reseed unsatisfactory areas or portions thereof immediately at the end of the maintenance period if a satisfactory stand has not been produced.
 - 6. Reseed/replant entire area if satisfactory stand does not develop by July 1 of the following year.

PART 2 PRODUCTS

2.01 FERTILIZER

- A. Commercial, uniform in composition, free-flowing, suitable for application with equipment designed for that purpose. Minimum percentage of plant food by weight.
- B. Application Rates: Per recommendation of seed provider.
- C. Mix:
 - 1. Nitrogen: 10.
 - 2. Phosphoric Acid: 10.
 - 3. Potash: 10.

D. Top Dress Type: As recommended by local authority.

2.02 SEED

- A. Fresh, clean new-crop seed that complies with the tolerance for purity and germination established by Official Seed Analysts of North America.
- B. Beds shall be seeded with a native, wet-meadow seed mix of 40 percent forbs and 60 percent grasses/sedge/rush.
- C. Forbs:

Scientific Name	Common Name
<i>Anemone canadensis</i>	Canadian anemone
<i>Angelica atropurpurea</i>	Angelica
<i>Asclepias incarnata</i>	Swamp milkweed
<i>Eupatorium perfoliatum</i>	Boneset
<i>Eupatorium maculatum</i>	Joe-Pye weed
<i>Helenium autumnale</i>	Sneezeweed
<i>Iris virginica</i>	Southern blue flag
<i>Liatris spicata</i>	Marsh blazing star
<i>Lobelia siphilitica</i>	Great blue lobelia
<i>Rudbeckia fulgida</i>	Sweet black-eyes Susan
<i>Symphotricum puniceum</i>	Swamp aster
<i>Verbena hastata</i>	Blue vervain
<i>Veronica missurica</i>	Ironweed

D. Grasses/sedge/rush:

Scientific Name	Common Name
<i>Carex spp.</i>	Carex species
<i>Elymus virginicus</i>	Virginia wild rye
<i>Scirpus spp.</i>	Scirpus species
<i>Sparganium eurycarpum</i>	Common bur reed

2.03 STRAW MULCH

- A. Threshed straw of oats, wheat, barley, or rye, free from seed of noxious weeds.

2.04 HYDROSEEDING MULCH

- A. Wood Cellulose Fiber Mulch:
 - 1. Specially processed wood fiber containing no growth or germination inhibiting factors.
 - 2. Dyed a suitable color to facilitate inspection of material placement.
 - 3. Manufactured such that after addition and agitation in slurry tanks with water, the material fibers will become uniformly suspended to form homogenous slurry.
 - 4. When hydraulically sprayed on ground, material will allow absorption and percolation of moisture.

PART 3 EXECUTION

3.01 PREPARATION

- A. Application of seed shall be to top of lightweight aggregate covering wetland cells.
- B. Cover seeds with mulch.

3.02 FERTILIZER

- A. Apply evenly over area on top of mulch in accordance with vendor instructions.
- B. Application Rate: 20 pounds per acre minimum.

3.03 SEEDING

- A. Start within 2 days of preparation completion.
- B. Hydroseed slopes steeper than 3H:1V. Flatter slopes may be mechanically seeded.
- C. Mechanical: Broadcast seed in two different directions.
 - 1. Sow seed at uniform rate of 12 pounds per acre.
 - 2. Use Brillion type seeder.
 - 3. Broadcasting will be allowed only in areas too small to use Brillion type seeder. Where seed is broadcast, increase seeding rate 20 percent.

- D. Hydroseeding (if used, Contractor choice):
1. Application Rate: 5 pounds per 1,000 square feet.
 2. Apply on moist soil, only after free surface water has drained away.
 3. Prevent drift and displacement of mixture into other areas.
 4. Upon application, allow absorption and percolation of moisture into ground.
 5. Mixtures: Seed and fertilizer may be mixed together, apply within 30 minutes of mixing to prevent fertilizer from burning seed.
- E. Mulching: Apply uniform cover of straw mulch at a rate of 2 tons per acre.

3.04 FIELD QUALITY CONTROL

- A. Evaluate performance of seeding on or about June 15th. Schedule field evaluation with the Engineer by written notice by the end of May. The Engineer will, within 15 days of field evaluation, determine if a satisfactory stand has been established.
- B. If a satisfactory stand has not been established, the Engineer will make another determination by mid-August if reseeded has been necessary. If not successful, the Contractor shall conduct another dormant seeding that same year with an Engineer approved plan to remedy problems with seed germination.

END OF SECTION

**SECTION 40 27 00
PROCESS PIPING AND SPECIALTIES**

PART 1 GENERAL

1.01 REFERENCES

- A. American Society of Testing and Materials International (ASTM).

1.02 DEFINITIONS

- A. Submerged or Wetted:
 - 1. Zone below elevation of: Detention Basin Emergency Spillway (EL 749).

1.03 DESIGN REQUIREMENTS

- A. Where pipe diameter, thickness, pressure class, pressure rating, or thrust restraint is not shown or specified, design piping system in accordance with the following:
 - 1. Buried Piping: H20-S16 traffic load with 1.5 impact factor, AASHTO HB-17, as applicable.

1.04 SUBMITTALS

- A. Action Submittals:
 - 1. Shop Fabricated Piping: Layout drawing showing location of each pipe section and each special length; number or otherwise designate laying sequence on each piece.
 - 2. Pipe Wall Thickness: Identify wall thickness and rational method or standard applied to determine wall thickness for each size of each different service including exposed, submerged, buried, and concrete-encased installations for Contractor-designed piping.
- B. Informational Submittals:
 - 1. Manufacturer's Certification of Compliance:
 - a. Pipe and fittings.
 - 2. Nondestructive inspection and testing procedures.
 - 3. Laboratory Testing Equipment: Certified calibrations, manufacturer's product data, and test procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. In accordance with Section 01 61 00, Common Product Requirements, and:
 - 1. Flanges: Securely attach metal, hardboard, or wood protectors over entire gasket surface.
 - 2. Threaded or Socket Welding Ends: Fit with metal, wood, or plastic plugs or caps.
 - 3. Linings and Coatings: Prevent excessive drying.
 - 4. Cold Weather Storage: Locate products to prevent coating from freezing to ground.
 - 5. Handling: Use heavy canvas or nylon slings to lift pipe and fittings.

PART 2 PRODUCTS

2.01 PIPING

- A. As specified on Piping Data Sheet(s) and Piping Schedule located at the end of this section as Supplement.
- B. Diameters Shown:
 - 1. Standardized Products: Nominal size.

2.02 JOINTS

- A. Mechanical connections of high-density polyethylene pipe to auxiliary equipment such as valves, and other piping systems shall be through flanged connections consisting of the following:
 - 1. A polyethylene stub end thermally butt-fused to end of pipe.
 - 2. Steel backing flange, 125-pound, ASME B16.1 standard.
 - 3. Bolts and nuts of sufficient length to show a minimum of three complete threads when joint is made and tightened to manufacturer's standard. Retorque nuts after 4 hours.
 - 4. Gaskets as required.

2.03 GASKET LUBRICANT

- A. Lubricant shall be supplied by pipe manufacturer and no substitute or "or-equal" will be allowed.

2.04 VENT AND DRAIN VALVES

- A. Pipeline 2-Inch Diameter and Smaller: 1/2-inch vent, 1-inch drain, unless shown otherwise.

- B. Pipelines 2-1/2-Inch Diameter and Larger: 3/4-inch vent, 1-inch drain, unless shown otherwise.

2.05 FABRICATION

- A. Mark each pipe length on outside with the following:
 - 1. Size or diameter and class.
 - 2. Manufacturer's identification and pipe serial number.
 - 3. Location number on laying drawing.
 - 4. Date of manufacture.
- B. Code markings according to approved Shop Drawings.

2.06 FINISHES

- A. Factory prepare, prime, and finish coat in accordance with Pipe Data Sheet(s) and Piping Schedule.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify size, material, joint types, elevation, horizontal location, and pipe service of existing pipelines to be connected to new pipelines or new equipment.
- B. Inspect size and location of structure penetrations to verify adequacy of wall pipes, sleeves, and other openings.

3.02 PREPARATION

- A. Notify the Engineer at least 2 weeks prior to field fabrication of pipe or fittings.
- B. Inspect pipe and fittings before installation, clean ends thoroughly, and remove foreign matter and dirt from inside.
- C. Damaged Coatings and Linings: Repair using original coating and lining materials in accordance with manufacturer's instructions.

3.03 INSTALLATION—GENERAL

- A. Join pipe and fittings in accordance with manufacturer's instructions, unless otherwise shown or specified.
- B. Remove foreign objects prior to assembly and installation.

C. Flanged Joints:

1. Install perpendicular to pipe centerline.
2. Bolt Holes: Straddle vertical centerlines, aligned with connecting equipment flanges or as shown.
3. Use torque-limiting wrenches to ensure uniform bearing and proper bolt tightness.
4. Plastic Flanges: Install annular ring filler gasket at joints of raised-face flange.
5. Grooved Joint Flange Adapters: Include stainless steel washer plates as required for mating to serrated faces and lined valves and equipment.
6. Raised-Face Flanges: Use flat-face flange when joining with flat-faced ductile or cast iron flange.
7. Verify compatibility of mating flange to adapter flange gasket prior to selecting grooved adapter flanging.
8. Flange fillers are to be avoided, but if necessary, may be used to make up for small angles up to 6 degrees and for filling gaps up to 2 inches between flanges. Stacked flange fillers shall not be used.
9. Threaded flanged joints shall be shop fabricated and delivered to Site with flanges in-place and properly faced.
10. Manufacturer: Same as pipe manufacturer.

D. Threaded and Coupled Joints:

1. Conform to ASME B1.20.1.
2. Produce sufficient thread length to ensure full engagement when screwed home in fittings.
3. Countersink pipe ends, ream and clean chips and burrs after threading.
4. Make connections with not more than three threads exposed.
5. Lubricate male threads only with thread lubricant or tape as specified on Piping Data Sheets.

E. Grooved-End Joints:

1. Piping shall be grooved in accordance with the manufacturer's latest published instructions and shall be accurately cut with tools conforming to coupling manufacturer's standards and to AWWA C606.
2. Install grooved joint couplings and gaskets in accordance with manufacturer's latest published installation instructions.

F. Pipe Connections at Concrete Structures: As specified in Article Piping Flexibility Provisions in Section 40 27 01, Process Piping Specialties.

G. High-Density Polyethylene Piping:

1. Join pipes, fittings, and flange connections by means of thermal butt-fusion.
2. Perform butt-fusion in accordance with pipe manufacturer's recommendations as to equipment and technique.
3. Special Precautions at Flanges: Polyethylene pipe connected to heavy fittings, manholes, and rigid structures shall be supported in such a manner that no subsequent relative movement between polyethylene pipe at flanged joint and rigid structures is possible.

3.04 INSTALLATION—EXPOSED PIPING

- A. Piping Runs: Parallel and perpendicular to floor of structures, unless shown otherwise.
- B. Group piping wherever practical at common elevations.
- C. Install piping so that no load or movement in excess of that stipulated by equipment manufacturer will be imposed upon equipment connection; install to allow for contraction and expansion without stressing pipe, joints, or connected equipment.
- D. Piping clearance, unless otherwise shown:
 1. From Adjacent Work: Minimum 1 inch from nearest extremity of completed piping system including flanges, valve bodies or mechanisms, insulation, or hanger/support systems.

3.05 INSTALLATION—BURIED PIPE

- A. Joints:
 1. Dissimilar Buried Pipes: Provide concrete closure collar for gravity and low pressure (maximum 10 psi) piping or as shown.
 2. Concrete Encased or Embedded Pipe: Do not encase joints in concrete, unless specifically shown.
- B. Placement:
 1. Keep trench dry until pipe laying and joining are completed.
 2. Pipe Base and Pipe Zone: As specified in Section 31 23 23.15, Trench Backfill.
 3. Exercise care when lowering pipe into trench to prevent twisting or damage to pipe.
 4. Measure for grade at pipe invert, not at top of pipe.

5. Excavate trench bottom and sides of ample dimensions to permit visual inspection and testing of entire flange, valve, or connection.
6. Prevent foreign material from entering pipe during placement.
7. Close and block open end of last laid pipe section when placement operations are not in progress and at close of day's work.
8. Lay pipe upgrade with bell ends pointing in direction of laying.
9. Deflect pipe at joints for pipelines laid on a curve using unsymmetrical closure of spigot into bell. If joint deflection of standard pipe lengths will not accommodate horizontal or vertical curves in alignment, provide:
 - a. Shorter pipe lengths.
 - b. Special mitered joints.
 - c. Standard or special fabricated bends.
10. After joint has been made, check pipe alignment and grade.
11. Place sufficient pipe zone material to secure pipe from movement before next joint is installed.
12. Prevent uplift and floating of pipe prior to backfilling.

C. HDPE Pipe Placement:

1. Lay pipe snaking from one side of trench to other.
2. Offset: As recommended by manufacturer for maximum temperature variation between time of fusion welding and during operation.
3. Do not lay pipe when temperature is below 40 degrees F, or above 90 degrees F when exposed to direct sunlight.
4. Shield ends to be joined from direct sunlight prior to and during the laying operation.

D. Tolerances:

1. Deflection from Horizontal Line, HDPE: Maximum 2 inches.
2. Deflection From Vertical Grade: Maximum 1/4 inch.
3. Joint Deflection: Maximum of 75 percent of manufacturer's recommendation.
4. Horizontal position of pipe centerline on alignment around curves maximum variation of 1.75 feet from position shown.
5. Pipe Cover: Minimum 3 feet, unless otherwise shown.

3.06 SLAB, FLOOR, WALL, AND ROOF PENETRATIONS

- A. Application and Installation: As specified in Section 40 27 01, Process Piping Specialties.

3.07 BRANCH CONNECTIONS

- A. Do not install branch connections smaller than 1/2-inch nominal pipe size, unless shown otherwise.
- B. When line of lower pressure connects to a line of higher pressure, requirements of Piping Data Sheet for higher pressure rating prevails, unless otherwise shown.
- C. Threaded Pipe Tap Connections:
 - 1. Limitations: Threaded taps in pipe barrel are unacceptable.

3.08 VENTS AND DRAINS

- A. Vents and drains at high and low points in piping required for completed system may or may not be shown. Install vents on high points and drains (3/8-inch holes at 15-foot spacing) on low points of pipelines at all low and high point locations.

3.09 FIELD FINISHING

- A. Notify Engineer at least 3 days prior to start of any surface preparation or coating application work.
- B. Any piping damaged during installation shall be replaced and reinstalled according to the drawings.

3.10 PIPE IDENTIFICATION

- A. As specified in Section 31 23 23.15, Trench Backfill.

3.11 FIELD QUALITY CONTROL

- A. Pressure Leakage Testing: As specified in Section 40 80 01, Process Piping Leakage Testing.

3.12 CLEANING

- A. Following assembly and testing, and prior to final acceptance, flush pipelines (except as stated below) with water at 2.5 fps minimum flushing velocity until foreign matter is removed.
- B. If impractical to flush large diameter pipe at 2.5 fps or blow at 4,000 fpm velocity, clean in-place from inside by brushing and sweeping, then flush or blow line at lower velocity.

C-437, Natural Treatment System Improvements

- C. Remove accumulated debris through drains 2 inches and larger or by removing spools and valves from piping.

3.13 SUPPLEMENTS

- A. The supplements listed below, following “End of Section,” are part of this specification:
 - 1. Piping Schedule Legend.
 - 2. Piping Schedule.

END OF SECTION

PIPING SCHEDULE LEGEND

SERVICE

SD	Storm Drain
SB	Splitter Box
DSC	Dosing Siphon Chamber
NTS	Natural Treatment System

EXPOSURE

BUR	Buried
EXP	Exposed
SUB	Submerged

MATERIAL

HDPE	High-Density Polyethylene
------	---------------------------

JOINT TYPE

FL	Flanged
GR	Grooved
HU	Hub and spigot
PRJ	Proprietary Restrained
RM	Restrained Mechanical
S	Screwed
W	Welded (including solvent and fusion)

PRESSURE TEST

G	Gravity Service: Test pressure is not shown on gravity services. Test to highest liquid level that pipe can be subject to.
H	Hydrostatic
I	In Service

Piping Schedule								
Service	Legend	Size (in) ¹	Exposure	Piping Material	Specification Section	Joint Type	Test Pressure (psig)	Test Specification Section
Splitter Box Inflow	SB	24	BUR	HDPE	33 05 01.10	Electrofuse	5	40 80 01
Dosing Chamber Inflow	DSC	8-12	BUR	HDPE	33 05 01.10	Electrofuse	5	40 80 01
NTS Distribution	NTS	4-12	BUR/EXP	HDPE	33 05 01.10	Electrofuse	5	40 80 01*
NTS Collection	NTS	4-12	BUR/SUB	HDPE	33 05 01.10	Electrofuse	5	40 80 01*

NOTES:
 *Pressure testing of pipes located within and over NTS 1 and NTS 2. The Contractor will flow water thru piping to verify minimal leakage and that all pipe joints are properly connected, flow test shall be witnessed by the Engineer, prior to covering.

SECTION 40 27 02
PROCESS VALVES AND OPERATORS

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Society of Mechanical Engineers (ASME):
 - a. B16.1, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
 - b. B16.44, Manually Operated Metallic Gas Valves for Use in Above Ground Piping Systems up to 5 psi.
 2. American Water Works Association (AWWA):
 - a. C500, Metal-Seated Gate Valves for Water Supply Service.
 - b. C508, Swing-Check Valves for Waterworks Service, 2-In. Through 24-In. (50-mm Through 600-mm) NPS.
 - c. C509, Resilient-Seated Gate Valves for Water Supply Service.
 - d. A276, Standard Specification for Stainless Steel Bars and Shapes.
 - e. A351/A351M, Standard Specification for Castings, Austenitic, for Pressure-Containing Parts.
 - f. A380, Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
 - g. A564/A564M, Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes.
 3. Manufacturers Standardization Society (MSS):
 - a. SP-80, Bronze Gate, Globe, Angle, and Check Valves.
 - b. SP-81, Stainless Steel, Bonnetless, Flanged Knife Gate Valves.
 - c. SP-85, Gray Iron Globe and Angle Valves, Flanged and Threaded Ends.
 4. NSF International (NSF): 61, Drinking Water System Components—Health Effects.
 5. UL.
 6. USC Foundation for Cross-Connection Control and Hydraulic Research.

1.02 SUBMITTALS

- A. Action Submittals:
1. Shop Drawings:
 - a. Product data sheets for each make and model. Indicate valve Type Number, applicable Tag Number, and facility name/number or service where used.

- b. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.
- c. Sizing calculations for open-close/throttle and modulating valves.

B. Informational Submittals:

- 1. Manufacturer's Certificate of Compliance.
- 2. Tests and inspection data.
- 3. Operation and Maintenance Data.
- 4. Manufacturer's Certificate of Proper Installation.

PART 2 PRODUCTS

2.01 GENERAL

- A. Valves to include operator, actuator, chain wheel, extension stem, floor stand, operating nut, chain, wrench, and accessories to allow a complete operation from the intended operating level.
- B. Valve to be suitable for intended service. Renewable parts not to be of a lower quality than specified.
- C. Valve same size as adjoining pipe, unless otherwise called out on the Drawings or in Supplements.
- D. Valve ends to suit adjacent piping.
- E. Resilient seated valves shall have no leakage (drip-tight) in either direction at valve rated design pressure. All other valves shall have no leakage (drip-tight) in either direction at valve rated design pressure, unless otherwise allowed for in this section or in stated valve standard.
- F. Size operators and actuators to operate valve for full range of pressures and velocities.
- G. Valve to open by turning counterclockwise, unless otherwise specified.
- H. Factory mount operator, actuator, and accessories.

2.02 SCHEDULE

- A. Additional requirements relative to this section located at the end of this section.

2.03 MATERIALS

- A. Bronze and brass valve components and accessories that have surfaces in contact with water to be alloys containing less than 16 percent zinc and 2 percent aluminum.
 - 1. Approved alloys are of the following ASTM designations: B61, B62, B98/B98M (Alloy UNS No. C65100, C65500, or C66100), B139/B139M (Alloy UNS No. C51000), B584 (Alloy UNS No. C90300 or C94700), B164, B194, and B127.
 - 2. Stainless steel Alloy 18-8 may be substituted for bronze.
- B. Valve materials in contact with or intended for drinking water service to meet the following requirements:
 - 1. Materials to comply with requirements of the Safe Drinking Water Act and other applicable federal, state, and local requirements.
 - 2. Coatings materials to be formulated from materials deemed acceptable to NSF 61.

2.04 FACTORY FINISHING

- A. General:
 - 1. Interior coatings for valves and hydrants shall be in accordance with AWWA C550, unless otherwise specified.
 - 2. Material in contact with potable water shall conform to NSF 61.
 - 3. Exposed safety isolation valves and lockout valves with handles, or chain wheels shall be “safety yellow.”
- B. Where epoxy lining and coating are specified, factory finishing shall be as follows:
 - 1. In accordance with AWWA C550.
 - 2. Either two-part liquid material or heat-activated (fusion) material except only heat-activated material if specified as “fusion” or “fusion bonded” epoxy.
 - 3. Minimum 7-mil dry film thickness except where limited by valve operating tolerances.

2.05 VALVES

A. Gate Valves:

1. General:
 - a. AWWA gate valves to be in full compliance with stated AWWA standard and the following requirements:
 - 1) Provide 2-inch operating nut for AWWA gate valves 12 inches and smaller.
 - 2) Provide totally enclosed spur or bevel gear operator with indicator for AWWA gate valves 14 inches and larger.
 - 3) Provide Affidavit of Compliance per the applicable AWWA standard for AWWA gate valves.
 - 4) Mark AWWA gate valves with manufacturer's name or mark, year of valve casting, valve size, and working water pressure.
 - 5) Repaired AWWA gate valves shall not be submitted or supplied.
 - 6) Supply AWWA gate valves with stainless steel bolting.
 - 7) AWWA C509 and AWWA C515 valves may be substituted for each other.
2. Type V107 Gate Valve 2 Inches and Smaller:
 - a. All-bronze, screwed bonnet, packed gland, NPT threaded ends, single solid wedge gate, rising stem, stainless steel seat rings, Class 300 rated 300 psi SWP/1,000 psi CWP, complies with MSS SP-80 Type 2.
 - b. Manufacturers and Products:
 - 1) Crane; Figure 634E.
 - 2) Stockham; Figure B-145.
3. Type V137 Resilient Seated Gate Valve 4 Inches to 12 Inches:
 - a. UL Listed and FM Approved for fire protection, iron body, resilient seat, bronze mounted, ASME B16.1 Class 125 flanged ends, nonrising stem, 2-inch operating nut, in accordance with AWWA C509, design working water pressure 200 psig, full port, fusion-epoxy coated inside and outside per AWWA C550, NSF 61 certified, indicator post flange and indicator post assembly with lockable handle.
 - b. Manufacturers and Products:
 - 1) Kennedy Valve; Ken-Seal II.
 - 2) M&H Valve; Style 4067.
 - 3) Mueller; P-2360.

2.06 OPERATORS

A. Manual Operators:

1. General:
 - a. For AWWA valves, operator force not to exceed requirements of applicable valve standard. Provide gear reduction operator when force exceeds requirements.
 - b. For non-AWWA valves, operator force not to exceed applicable industry standard or 80 pounds, whichever is less, under operating condition, including initial breakaway. Provide gear reduction operator when force exceeds requirements.
 - c. Operator self-locking type or equipped with self-locking device.
 - d. Position indicator on quarter-turn valves.
 - e. Worm and gear operators one-piece design, worm-gears of gear bronze material. Worm of hardened alloy steel with thread ground and polished. Traveling nut type operator's threaded steel reach rod with internally threaded bronze or ductile iron nut.
2. Exposed Operator:
 - a. Cranks on gear type operator.
 - b. Chain wheel operator with tieback, extension stem, floor stand, and other accessories to permit operation from normal operation level.
 - c. Valve handles to take a padlock, and wheels a chain and padlock.
3. Buried Operator:
 - a. Buried service operators on valves larger than 2-1/2 inches shall have a 2-inch AWWA operating nut. Buried operators on valves 2 inches and smaller shall have cross handle for operation by forked key. Enclose moving parts of valve and operator in housing to prevent contact with the soil.
 - b. Buried service operators to be grease packed and gasketed to withstand submersion in water to 20 feet minimum.
 - c. Buried valves shall have extension stems, bonnets, and valve

2.07 ACCESSORIES

- A. Tagging: 1-1/2-inch diameter heavy brass or stainless steel tag attached with No. 16 solid brass or stainless steel jack chain for each valve operator, bearing valve tag number shown on Manual Valve Schedule.
- B. T-Handled Operating Wrench:
 1. One each galvanized operating wrenches, 4 feet long.
 2. Manufacturers and Products:
 - a. Mueller; No. A-24610.
 - b. Clow No.; F-2520.
 3. One each galvanized operating keys for cross handled valves.

- C. Extension Bonnet for Valve Operator: Complete with enclosed stem, extension, support brackets, and accessories for valve and operator.
 - 1. Manufacturers and Products:
 - a. Pratt.
 - b. DeZurik.

- D. Floor Stand:
 - 1. Nonrising, heavy pattern, indicating type.
 - 2. Complete with solid extension stem, coupling, stem guide brackets, and yoke attachment. Stem length as required to connect valve operating nut and floor stand.
 - 3. Stem Guide: Space such that stem L/R ratio does not exceed 200.
 - 4. Anchor Bolts: Type 304 stainless steel.
 - 5. Manufacturers and Products:
 - a. Clow; Figure F-5515.
 - b. Mueller, Figure A-26426.

- E. Floor Box:
 - 1. Plain type, for support of nonrising type stem.
 - 2. Complete with solid extension stem, operating nut, and stem guide brackets. Stem length as required to extend valve operating nut to within 3 inches of finish floor.
 - 3. Stem Guide: Space such that stem L/R ratio does not exceed 200.
 - 4. Anchor Bolts: Type 304 stainless steel.
 - 5. Manufacturers and Products:
 - a. Neenah Foundry; R 7506.
 - b. Clow; No. F5690.

- F. Chain Wheel and Guide:
 - 1. Complete with chain.
 - 2. Galvanized or cadmium-plated.
 - 3. Manufacturers and Products:
 - a. Clow Corp.; Figure F-5680.
 - b. Walworth Co.; Figure 804.
 - c. DeZurik Corp.; Series W or LWG.

- G. Cast-Iron Valve Box: Designed for traffic loads, sliding type, with minimum of 5-1/4-inch ID shaft.
 - 1. Box: Cast iron with minimum depth of 9 inches.
 - 2. Lid: Cast iron, minimum depth 3 inches, non-locking type marked STORMWATER.

3. Extensions: Cast iron.
 4. Two-piece box and lid for valves 4 inches through 12 inches, three-piece box and lid for valves larger than 12 inches with base sized for valve.
 5. Valve extension stem for valves with operating nuts 3 feet or greater below finish grade.
 6. Manufacturers and Products:
 - a. East Jordan Iron Works; Cast-Iron Valve Boxes.
 - b. Bingham & Taylor; Cast-Iron Valve Boxes.
- H. Indicator Post Assembly:
1. Cast or ductile iron post head, bell, and wrench with cast or ductile iron or steel barrel.
 2. Plexiglas or equal protected window to indicate OPEN and CLOSED position.
 3. Padlockable eye bolt for wrench.
 4. Adjustable bury depth. Bury depth as required for valve installation.
 5. UL Listed and FM Approved.
 6. Manufacturers and Products:
 - a. Clow; Style 2945.
 - b. Mueller; A-20806.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Flange Ends:
1. Flanged valve bolt holes shall straddle vertical centerline of pipe.
 2. Clean flanged faces, insert gasket and bolts, and tighten nuts progressively and uniformly.
- B. Valve Installation and Orientation:
1. General:
 - a. Install valves so handles operate from fully open to fully closed without encountering obstructions.
 - b. Install valves in location for easy access for routine operation and maintenance.
 - c. Install valves per manufacturer's recommendations.
 2. Gate, Globe, and Ball Valves:
 - a. Install operating stem vertical when valve is installed in horizontal runs of pipe having centerline elevations 4 feet 6 inches or less above finished floor, unless otherwise shown.

- b. Install operating stem horizontal in horizontal runs of pipe having centerline elevations greater than 4 feet 6 inches above finish floor, unless otherwise shown.
- C. Locate valve to provide accessibility for control and maintenance. Install access doors in finished walls and plaster ceilings for valve access.
- D. Extension Stem for Operator: Where depth of valve operating nut is 3 feet or greater below finish grade, furnish operating extension stem with 2-inch operating nut to bring operating nut to a point within 6 inches of finish grade.
- E. Torque Tube: Where operator for quarter-turn valve is located on floor stand, furnish extension stem torque tube of a type properly sized for maximum torque capacity of valve.
- F. Floor Box and Stem: Steel extension stem length shall locate operating nut in floor box.
- G. Chain Wheel and Guide: Install chain wheel and guide assemblies or chain lever assemblies on manually operated valves over 6 feet 9 inches above finish floor. Install chain to within 3 feet of finish floor. Where chains hang in normally traveled areas, use appropriate "L" type tie-back anchors. Install chains to within operator horizontal reach of 2 feet 6 inches maximum, measured from normal operator standing location or station.

3.02 TESTS AND INSPECTION

- A. Valve may be either tested while testing pipelines, or as a separate step.
- B. Test that valves open and close smoothly under operating pressure conditions. Test that two-way valves open and close smoothly under operating pressure conditions from both directions.
- C. Inspect air and vacuum valves as pipe is being filled to verify venting and seating is fully functional.
- D. Count and record number of turns to open and close valve; account for discrepancies with manufacturer's data.
- E. Set, verify, and record set pressures for relief and regulating valves.
- F. Automatic valves to be tested in conjunction with control system testing. Set opening and closing speeds, limit switches, as required or recommended by the Engineer.

- G. Test hydrostatic relief valve seating; record leakage. Adjust and retest to maximum leakage of 0.1 gpm per foot of seat periphery.

3.03 MANUFACTURER'S SERVICES

- A. Manufacturer's Representative: Present at Site for minimum person-days listed below, travel time excluded:
 - 1. 1 person-day for installation assistance and inspection.
 - 2. 1 person-day for functional and performance testing and completion of Manufacturer's Certificate of Proper Installation.

3.04 SUPPLEMENTS

- A. The supplement listed below, following "End of Section," is part of this specification.
 - 1. Manual Valve Schedule.

END OF SECTION

Manual Valve Schedule						
Tag No.	Valve Type No.	Size (inches)	Maximum Pressure (psig)	Average Flow (gpm)	Maximum Flow (gpm)	Fluid
1A	V137	8	10	450	750	stormwater
1B	V137	8	10	450	750	stormwater
1C	V137	8	10	450	750	stormwater
1D	V137	8	10	450	750	stormwater
1E	V137	8	10	450	750	stormwater
1F	V137	8	10	450	750	stormwater
NA*	V107	2	10	450	750	stormwater
NOTES: * 12 service valves needed at each siphon box.						

**SECTION 40 80 01
PROCESS PIPING LEAKAGE TESTING**

PART 1 GENERAL

1.01 SUBMITTALS

A. Informational Submittals:

1. Testing Plan: Submit prior to testing and include at least the information that follows.
 - a. Testing dates.
 - b. Piping systems and section(s) to be tested.
 - c. Test type.
 - d. Method of isolation.
 - e. Calculation of maximum allowable leakage for piping section(s) to be tested.
2. Certifications of Calibration: Testing equipment.
3. Certified Test Report.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PREPARATION

- A. Notify the Engineer in writing 5 days in advance of testing. Perform testing in presence of the Engineer.
- B. Gravity Piping:
 1. Perform testing after service connections, manholes, and backfilling have been completed between stations to be tested.
 2. Determine groundwater level at time of testing by exploratory holes or other method acceptable to the Engineer.

3.02 HYDROSTATIC TEST FOR PRESSURE PIPING

- A. Fluid: Clean water of such quality to prevent corrosion of materials in piping system.
- B. Exposed Piping:
 1. Perform testing on installed piping prior to application of insulation.
 2. Maximum Filling Velocity: 0.25 foot per second, applied over full area of pipe.

3. Vent piping during filling. Open vents at high points of piping system or loosen flanges, using at least four bolts, or use equipment vents to purge air pockets.
4. Maintain hydrostatic test pressure continuously for 30 minutes, minimum, and for such additional time as necessary to conduct examinations for leakage.
5. Examine joints and connections for leakage.
6. Correct visible leakage and retest as specified.
7. Empty pipe of water prior to final cleaning.

C. Buried Piping:

1. Test after backfilling has been completed.
2. Expel air from piping system during filling.
3. Apply and maintain specified test pressure with hydraulic force pump. Valve off piping system when test pressure is reached.
4. Maintain hydrostatic test pressure continuously for 2 hours minimum, reopening isolation valve only as necessary to restore test pressure.
5. Determine actual leakage by measuring quantity of water necessary to maintain specified test pressure for duration of test.
6. Maximum Allowable Leakage:

$$L = \frac{SD(P)^{1/2}}{133,200}$$

where:

- L = Allowable leakage, in gallons per hour.
- S = Length of pipe tested, in feet.
- D = Nominal diameter of pipe, in inches.
- P = Test pressure during leakage test, in pounds per square inch.

7. Correct leakage greater than allowable, and retest as specified.

3.03 HYDROSTATIC TEST FOR GRAVITY PIPING

- A. Testing Equipment Accuracy: Plus or minus 1/2-gallon water leakage under specified conditions.
- B. Maximum Allowable Leakage: 0.16 gallons per hour per inch diameter per 100 feet. Include service connection footage in test section, subjected to minimum head specified.

- C. Exfiltration Test:
 - 1. Hydrostatic Head:
 - a. At least 6 feet above maximum estimated groundwater level in section being tested.
 - b. No less than 6 feet above inside top of highest section of pipe in test section, including service connections.
 - 2. Length of Pipe Tested: Limit length such that pressure on invert of lower end of section does not exceed 30 feet of water column.
- D. Infiltration Test:
 - 1. Groundwater Level: At least 6 feet above inside top of highest section of pipe in test section, including service connections.
- E. Piping with groundwater infiltration rate greater than allowable leakage rate for exfiltration will be considered defective even if pipe previously passed a pressure test.
- F. Defective Piping Sections: Replace or test and seal individual joints, and retest as specified.

3.04 PNEUMATIC TEST FOR GRAVITY PIPING

- A. Equipment:
 - 1. Calibrate gauges with standardized test gauge at start of each testing day. Engineer will witness calibration.
 - 2. Install gauges, air piping manifolds, and valves at ground surface.
 - 3. Provide pressure release device, such as rupture disc or pressure relief valve, to relieve pressure at 6 psi or less.
 - 4. Restrain plugs used to close sewer lines to prevent blowoff.
- B. Procedure:
 - 1. Require that no person enter manhole where pipe is under pressure.
 - 2. Slowly introduce air into pipe section until internal air pressure reaches 4 psi greater than average back pressure of groundwater submerging pipe.
 - 3. Allow 2 minutes minimum for air temperature to stabilize.

- C. Allowable Leakage: Test section will be considered defective when time required for pressure to decrease from 3.5 to 2.5 psi greater than average back pressure of groundwater submerging pipe is less than that computed utilizing values from following table:

TABLE 1*					
A Pipe Diameter (Inches)	B Time per Foot up to Length in Col C (Seconds)	C Test Length (Feet)	D Test Time for any Length Between Col C & E (Min:Sec)	E Length at Which Time in Col F Applies (Feet)	F Time per Foot for Total Length (Seconds)
4	0.18	636	1:54	1,114	0.10
6	0.40	424	2:50	743	0.23
8	0.71	318	3:47	557	0.41
10	1.11	255	4:43	446	0.63
12	1.60	212	5:40	371	0.91
15	2.50	170	7:05	297	1.42
18	3.62	141	8:30	248	2.06
21	4.92	121	9:55	212	2.81
24	6.42	106	11:20	187	3.67
<p>EXAMPLE: 15-inch diameter pipe: For 150 feet, T = 2.50 sec (Col B) x 150 ft = 375 sec = 6:15 For 250 feet, T = 7:05 (Col D) For 500 feet, T = 1.42 sec (Col F) x 500 ft = 710 sec = 11:50</p>					
<p>*Based on 0.003 cfm per square foot with a minimum significant loss of 2 cfm and a maximum loss of 3.5 cfm.</p>					

- D. Piping with groundwater infiltration rate greater than allowable leakage rate for exfiltration will be considered defective even if pipe previously passed a pressure test.
- E. Defective Piping Sections: Replace or test and seal individual joints, and retest as specified.

3.05 FIELD QUALITY CONTROL

A. Test Report Documentation:

1. Test date.
2. Description and identification of piping tested.
3. Test fluid.
4. Test pressure.
5. Remarks, including:
 - a. Leaks (type, location).
 - b. Repair/replacement performed to remedy excessive leakage.
6. Signed by the Contractor and Engineer to represent that test has been satisfactorily completed.

END OF SECTION

Project Specifications

Owner: Gerald R. Ford International Airport Authority

Project Title: Natural Treatment System Improvements, Phase 1

Project #: C-437 (2250383)

2 2020 MDOT STANDARD SPECIFICATIONS

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Section 101. Terms, Format, and Definitions

101.01. General

The titles and headings of the sections, subsections, and subparts are intended for reference and are not considered as bearing on their interpretation.

References in the contract to publications refer to the most recent edition, including interim publications that are current as of the advertisement date, unless otherwise specified by the contract.

References in the contract to the Department's procedures for inspection, sampling, testing, and certification of materials refer to the edition of the relevant manuals, Michigan Test Methods (MTMs), MDOT Standard Plans, and *MDOT Standard Specifications for Construction (Standard Specifications)* that is current as of the advertisement date unless otherwise specified by the contract.

101.02. Abbreviations

When the following abbreviations are used in the *Standard Specifications* and in the contract, they have the meanings listed below.

°C.....	degrees Celsius
°F.....	degrees Fahrenheit
AAN.....	American Association of Nurserymen
AAR.....	Association of American Railroads
AASHTO.....	American Association of State Highway and Transportation Officials
ABR.....	Certified Bridge Fabricator – Advanced (AISC Certification)
ABS.....	acrylonitrile butadiene styrene
AC.....	alternating current
ACA.....	ammoniacal copper arsenate
ACI.....	American Concrete Institute
ACPA.....	American Concrete Pipe Association
ACQ.....	ammoniacal copper quaternary
ACZA.....	ammoniacal copper zinc arsenate
ADA.....	Americans with Disabilities Act
ADT.....	average daily traffic
AGC.....	Associated General Contractors of America
AIA.....	American Institute of Architects
AISC.....	American Institute of Steel Construction
AISI.....	American Iron and Steel Institute
AMS.....	Aerospace Material Specification

ANSI	American National Standards Institute
APA	Authorized Public Agency
API	American Petroleum Institute
ARA.....	American Railway Association
AREMA	American Railway Engineering and Maintenance-of-Way Association
ARTBA	American Road & Transportation Builders Association
ASC.....	Accredited Standards Committee
ASCE	American Society of Civil Engineers
ASLA.....	American Society of Landscape Architects
ASME.....	American Society of Mechanical Engineers
ASNT	American Society for Nondestructive Testing
ASR.....	alkali-silica reactivity
ASTM.....	ASTM International
ATSSA	American Traffic Safety Services Association
AWG	American Wire Gauge
AWI	Aggregate Wear Index
AWPA.....	American Wood Protection Association
AWS.....	American Welding Society
AWWA.....	American Water Works Association
Blue Book	Equipment Watch's <i>Rental Rate Blue Book for Construction Equipment</i>
BPN.....	British Pendulum Number
BTU.....	British thermal unit
CA.....	copper azole
CaCl ₂	calcium chloride
CCA	chromated copper arsenate
centistoke.....	unit of measurement of kinematic viscosity
cfm	cubic feet per minute
CFR.....	Code of Federal Regulations
CIA	Construction Influence Area
CIE	International Commission on Illumination
CIP	compacted-in-place
CIP	cast-in-place
CJP	complete joint penetration
CMD.....	cross-machine direction
CNC	computer numerically controlled
Commission	Michigan State Transportation Commission
CPE.....	corrugated polyethylene
cPs.....	centipoise, a measurement of viscosity
CPT.....	Bridge Component Quality Management System Certification (AISC Certification)

CPV.....	corrugated polyvinyl chloride
Crg.....	contraction joint
CRSI.....	Concrete Reinforcing Steel Institute
CSP.....	concrete surface profile
CSQC.....	Contractor Staking Quality Control
CW.....	Civil Works
CWI.....	Certified Welding Inspector
dB.....	decibel
DBE.....	Disadvantaged Business Enterprise
DBI.....	dowel bar inserter
DC.....	direct current
DFT.....	dry film thickness
DI.....	ductile iron (pipe)
EGLE.....	Michigan Department of Environment, Great Lakes, and Energy
ESAL.....	equivalent single-axle load
Esc.....	expansion joint
FAA.....	Federal Aviation Administration
FC.....	Fracture Critical Endorsement (AISC Certification)
FCAW.....	flux-cored arc welding
FCC.....	Federal Communications Commission
FCM.....	fracture critical members
FHWA.....	(U.S. Department of Transportation) Federal Highway Administration
Forest Service.....	USDA Forest Service
FSS.....	Federal Specifications and Standards
fy.....	yield point
$G^*/\sin \theta$	high temperature stiffness
$G^*\sin \theta$	intermediate temperature stiffness
g/ft^2	gram per square foot
G_{mm}	maximum specific gravity of mixture
G_{sb}	bulk specific gravity of aggregate
G_{se}	effective specific gravity
GMAW.....	gas metal arc welding
GPS.....	Global Positioning System
HDPE.....	high-density polyethylene
HMA.....	hot mix asphalt
HP.....	high performance
HRWR.....	high-range water reducer
IBR.....	Certified Bridge Fabricator – Intermediate (AISC Certification)
ICEA.....	Insulated Cable Engineers Association

IEEE.....	Institute of Electrical and Electronics Engineers
IES.....	Illuminating Engineering Society
IMSA.....	International Municipal Signal Association
IP.....	internet protocol
ISA.....	International Society of Arboriculture
ISO.....	International Organization for Standardization
ISSA.....	International Slurry Surfacing Association
ITCP.....	Internal Traffic Control Plan
ITE.....	Institute of Traffic Engineers
ITS.....	Intelligent Transportation Systems
JMF.....	job mix formula
k.....	thermal conductivity
kip.....	1,000 pounds-force
kPa.....	kilopascal
ksi.....	kilo-pound per square inch
LA.....	Los Angeles
LAST.....	lowest anticipated service temperature
lb/cyd.....	pounds per cubic yard
lb/ft ³	pound per cubic foot
LBW.....	loss by washing
LCD.....	liquid crystal display
LED.....	light-emitting diode
LL.....	lane length
LM.....	loose measure
LMC.....	latex modified concrete
LRFD.....	Load and Resistance Factor Design
LRFR.....	load and resistance factor rating
MASH.....	Manual for Assessing Safety Hardware
MC.....	medium curing
MCA.....	Michigan Concrete Association
mcclux/sq m.....	millicandela per lux per square meter
MCL.....	Michigan Compiled Laws
MCS.....	Michigan Coordinate System
MD.....	machine direction
MDARD.....	Michigan Department of Agriculture & Rural Development
MDLARA.....	Michigan Department of Licensing and Regulatory Affairs
MDNR.....	Michigan Department of Natural Resources
MDOT.....	Michigan Department of Transportation
mil.....	thousandth of an inch
MIOSHA.....	Michigan Occupational Safety and Health Administration
mm.....	millimeter

MMUTCD.....	Michigan Manual of Uniform Traffic Control Devices
MPa.....	megapascal
mph.....	miles per hour
<i>MQAP Manual</i>	<i>MDOT's Materials Quality Assurance Procedures (MQAP) Manual</i>
MSA.....	Mine Safety Administration
MSA.....	Michigan Statutes Annotated
MT.....	magnetic particle testing
MTD.....	material transfer device
MTM.....	Michigan Test Method
MTR.....	Mill Test Report
N/A.....	not applicable
NaCl.....	sodium chloride
NBI.....	National Bridge Inventory
NCHRP.....	National Cooperative Highway Research Program
NCR.....	nonconformance report
N _d	design number of gyrations
NDT.....	nondestructive testing
NEC.....	National Electrical Code
NELMA.....	Northeastern Lumber Manufacturers Association
NEMA.....	National Electrical Manufacturers Association
NESC.....	National Electrical Safety Code
NHPMA.....	Northern Hardwood and Pine 'Manufacturers Association
N _i	initial number of gyrations
NIST.....	National Institute of Standards and Technology
N _m	maximum number of gyrations
N _m	Newton meter
NPCA.....	National Precast Concrete Association
NPDES.....	National Pollutant Discharge Elimination System
NPT.....	National Pipe Thread Tapered
NREPA.....	Natural Resources and Environmental Protection Act
NRMCA.....	National Ready Mixed Concrete Association
NTCIP.....	National Transportation Communications for ITS [Intelligent Transportation Systems] Protocol
OD.....	outside diameter
OD.....	oven dry
OGDC.....	open-graded drainage course
ohm.....	unit of electrical resistance
OJT.....	on-the-job training
Pa•s.....	pascal-second
PAV.....	Pressure Aging Vessel

P _b	percent asphalt binder content
PCC	Portland cement concrete
pcf	pounds per cubic foot
PCI	Precast/Prestressed Concrete Institute
PCMS	portable changeable message sign
PDF	portable document format
PE	polyethylene
PG	performance-graded
PJP	partial joint penetration
PLSS	Public Land Survey System
PPSS	paver-placed surface seal
psf	pounds per square foot
psi	pounds per square inch
psig	pounds per square in gauge
PT	penetrant testing
PTCSI	Pedestrian Traffic Control Signal Indications
PTS	portable traffic signal
PVC	polyvinyl chloride
QA	Quality Assurance
QAI	Quality Assurance Inspector
QC	Quality Control
rad/s	radian per second
RAP	reclaimed asphalt pavement
RC	rapid curing
RCRA	Resource Conservation and Recovery Act
RHW	rubber insulation, heat resistance of 75°C, water resistance
rms	root mean square
RPM	reflective pavement marker
RPM	raised pavement marker
RT	radiographic testing
SAE	Society of Automotive Engineers
SAW	submerged arc welding
SBR	Certified Bridge Fabricator – Simple (AISC Certification)
SCM	supplementary cementitious material
SDR	standard dimension ratio
SESC	soil erosion and sedimentation control
SFMC	silica fume modified concrete
SGC	Superpave gyratory compactor
SMAW	shielded metal arc welding
SPE	Sophisticated Paint Endorsement (AISC Certification)
SPIB	Southern Pine Inspection Bureau

SQRT	square root
SSPC	The Society for Protective Coatings
Superpave	Superior Performing Asphalt Pavements
TIG	tungsten inert gas
TON	turn-of-nut
Trg.....	tied joint
TRM	turf reinforcement mat
TRPM.....	temporary raised pavement marker
TS	total solids
TS	traffic signal
TSR.....	tensile strength ratio
UL	Underwriters Laboratories
USC	U.S. Code
USDA.....	United States Department of Agriculture
USDOT	U.S. Department of Transportation
USE.....	underground service entrance
UT	ultrasonic testing
UV	ultraviolet
VAC.....	volts alternating current
VDC	volts direct current
VFA	voids filled with asphalt
VMA	voids in mineral aggregate
VT	visual test
VTCSH.....	Vehicle Traffic Control Signal Heads
WCLIB	West Coast Lumber Inspection Bureau
w/cm ratio	water-cementitious material ratio
WPS.....	weld procedure specification
WR.....	wet reflective
WWPA.....	Western Wood Products Association

101.03. Definitions

Absolute Refusal. The nominal pile driving resistance value of 150% of the nominal pile driving resistance shown on the plans. Also see “Practical Refusal.”

Addendum. Revisions to the plans and/or proposal issued by the Department after the advertisement date but before the submission of the bid.

Adjustment. Monetary revision that applies to a contract unit price or to the entire contract.

Advertisement. Public announcement of a project inviting Contractors to submit bids for work to be performed and materials to be furnished.

- Authorization.** The Department's written approval of a contract modification.
- Average Daily Traffic (ADT).** The total volume of traffic during a time period that is greater than 1 day and less than 1 year and divided by the number of days in the time period.
- Award.** The Department's formal execution of the contract.
- Base Course.** Layer or layers of specified material placed on a subbase or subgrade to support a surface course.
- Bid.** A completed schedule of items submitted as an offer to perform work at quoted prices.
- Bid Appeal Committee.** Michigan Department of Transportation (MDOT) committee that performs the administrative review of appeals of low bid rejections.
- Bid Document.** An electronic document prepared using current Department software that includes the schedule of items, designated and specialty items, if applicable, and warranty obligations, if applicable.
- Bid Guaranty.** Amount the Bidder agrees, at the time of bid submission, to pay MDOT if the Bidder fails to execute the contract form and file satisfactory bonds and other required documents necessary for the award of the contract within the 21-day period provided or within Department-approved extensions.
- Bid Review Committee.** MDOT committee that reviews irregular bids for adherence to standard bid procedures. See subsection 102.06 for a definition of irregular bid.
- Bidder**
- A. Individual or legal entity submitting a bid.
 - B. An affiliated Bidder is a Bidder having a relationship in which one business concern or individual directly or indirectly controls or can control the others.
- Bridge.** Structure, including supports, built over a depression, watercourse, highway, railroad, or other obstruction with a clear span of at least 20 feet measured along the center of roadway.
- Calendar Day.** Every day shown on the calendar, beginning and ending at midnight. Unless otherwise specified in the contract, the word "day" means calendar day.
- Calendar Date Contract.** Contract in which the project is required to be physically complete or open to traffic on or before a designated date on the calendar.

Calendar Day Contract. Contract in which the time required to physically complete the project or open it to traffic is designated by the number of calendar days.

Certification of Disadvantaged Business Enterprise (DBE) Contractor.

Process in which the Department establishes that a Contractor meets the federal requirements of a DBE. Also see “Disadvantaged Business Enterprise.”

Change. Addition to or deletion from a pay item or condition.

Commission. Michigan State Transportation Commission.

Construction Influence Area (CIA). The project and the area surrounding the project, as shown in the contract, that define the limits of responsibility for traffic control.

Contract. Written agreement between the Department and the Contractor setting forth the obligations of the parties for the performance of and payment for the prescribed work. The contract includes the advertisement for bids, bid document, contract form, contract bonds, Standard Specifications, special details, MDOT Standard Plans, plans, proposal, addenda, notice of award, local agency agreements (when applicable), DBE commitment forms (when applicable), and warranty forms and bonds (when applicable).

Contract Modification. Regulation form prepared as a recommendation for changes in, adjustments to, or extras to the contract. The contract modification becomes an authorization (an approved modification) when it is signed by the duly authorized MDOT representative. Also see “Authorization.”

Contract Time. Time specified in the contract to perform and complete all the work, including authorized extensions of time.

Contract Unit Price. Unit price of a pay item.

Contractor. Individual or legal entity contracting with the Department to perform prescribed construction work and supply materials.

Controlling Operation. An operation that, if the Contractor’s expected rate of performance is not met or the scheduled start date is delayed, would delay the opening to traffic or completion of the entire project. A controlling operation may be on or off the job site. The size of the operation is not a factor in determining whether an operation is a controlling operation. Any operation on the critical path is a controlling operation (see “Critical Path”).

Coordination Clause. Clause in the contract that requires the Contractor to coordinate construction activities with agencies, utilities, or other Contractors.

Critical Path. Longest continuous path of activities through the contractual completion milestones in the schedule that establishes the scheduled completion date. The critical path is typically the path of activities with the least total float. The critical path may follow different paths of activities at different times during the performance of the work due to the progress of the work or revisions made to the schedule. Any operation on the critical path is a controlling operation.

Culvert. Structure, including supports, built over a depression, watercourse, highway, railroad, or other obstruction, with a clear span of less than 20 feet measured along the center of roadway.

Department

- A. Michigan Department of Transportation when the State is the awarding authority;
- B. Board of County Road Commissioners or Wayne County when a County is the awarding authority; or
- C. City or Village or authorized representative when the City or Village is the awarding authority.

Design Pile Length. Pile length shown on the plans.

Design Pile Tip Elevation. Pile tip elevation if the design pile length is shown on the plans.

Designated Classifications. Work classifications that the Department lists in the proposal as the major work classifications required to construct the project and requiring appropriate prequalification to perform the specified work.

Determined Low Bidder. The Bidder determined to have the lowest total bid for a project and to meet all project requirements.

Director. The person, as provided by law, to serve as the principal executive officer of the Department and to be responsible for executing the policies of the Commission.

Disadvantaged Business Enterprise (DBE). The definition as provided in 49 CFR 26.5.

Dynamic Formula. Empirical formula used to estimate nominal pile driving resistance during pile driving. The Federal Highway Administration (FHWA) Gates formula is specified.

Dynamic Testing. High strain dynamic testing conducted during pile driving to estimate the nominal pile driving resistance using instrumentation and signal-matching computer software.

Earth Grade. Elevation of the completely graded roadway before the pavement structure is placed.

Engineer

- A. The Director of the Department or the Engineer designated by the Director, acting directly or through authorized representatives, who is responsible for engineering supervision of the construction when the State of Michigan is the awarding authority;
- B. The Engineer representing the county when a county is the awarding authority; or
- C. The Engineer representing the city or village when a city or village is the awarding authority.

Estimate

- A. **Final Estimate.** Compilation of quantities showing work performed upon which final payment is made.
- B. **Progress Estimate.** Estimate made as the work progresses showing estimated work performed and materials furnished upon which periodic payments are made.

Estimated Pile Length. Length shown on the plans used as a guide for estimating the work and ordering test piles if the nominal pile driving resistance is shown on the plans.

Estimated Pile Tip Elevation. Elevation shown on the plans, estimated for piles to develop the nominal pile driving resistance.

Extension of Time. Additional contract time authorized by the Department.

Extra Work. Work determined to be essential to the satisfactory completion of the contract but that does not appear in the proposal as a specific pay item and is not included in the price bid for other items in the contract.

Falsework. Any temporary facility/device used to support a permanent structure until the structure is self-supporting. Falsework includes, but is not limited to, steel or timber beams, girders, columns, piles and foundations, and any propriety equipment including modular shoring frames, post shores, and adjustable horizontal shoring.

Float. The total available time to complete a non-controlling operation or sequence of non-controlling operations, as designated by the Contractor in the progress schedule, minus the total planned duration associated with the non-controlling operation or sequence of non-controlling operations. Float within the schedule is not for the exclusive use or benefit of the Department or the Contractor but is a resource available to both parties as needed until it expires.

Forms. Facility, device, or mold used to retain plastic or fluid concrete in its designated shape until it hardens.

Geohazard. Harmful event caused by a geological process (e.g., earthquake, landslide, tsunami, volcano).

Grade Separation. Structure that provides for highway traffic, pedestrian traffic, or utilities to pass over or under another highway or the tracks of a railway.

Highway. General term denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way.

Holidays. Recognized state holidays are New Year's Day, Martin Luther King Jr. Day, President's Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, the day after Thanksgiving Day, Christmas Eve, Christmas Day, and New Year's Eve.

Inspector. Representative of the Engineer assigned to test materials, perform inspections of contract performance, or both.

Laboratory. Testing laboratory operated by or designated by the Department.

Labor Dispute. Controversy between the Contractor and the Contractor's employees, union, bargaining agents, suppliers, or suppliers' bargaining agents or between unions that results in a work stoppage.

Lien Bond. The security furnished by the Contractor and the Contractor's surety to guarantee payment of the debts covered by the bond.

Limits of Earth Disturbance. Area extending 10 feet outside the slope stake line except adjacent to wetlands where the limits of earth disturbance are at the slope stake line.

Liquidated Damages. Monetary damages paid at a specified rate by the Contractor to the Department for work not completed by the completion dates or within specified time frames.

Local Traffic. Traffic that has origin or destination within the CIA.

Major and Minor Pay Items. Pay items with an original item value that meets any of the criteria listed below are considered major pay items. All other original pay items are considered minor. The original item value is the product of the plan quantity of the pay item and the contract unit price.

- A. The original contract amount is less than or equal to \$5,000,000 and the original item value is equal to or greater than 5% of the original contract amount.
- B. The original contract amount is greater than \$5,000,000 but less than or equal to \$20,000,000 and the original item value is equal to or greater than 4% of the original contract amount but not less than \$250,000.
- C. The original contract amount is greater than \$20,000,000 but less than or equal to \$30,000,000 and the original item value is equal to or

greater than 3% of the original contract amount but not less than \$800,000.

- D. The original contract amount is greater than \$30,000,000 and the original item value is equal to or greater than 2% of the original contract amount but not less than \$900,000.
- E. If no major pay items are identified using the criteria in A through D above, then the major pay item or items are all of the original pay items, in sequence from the greatest original item value to the next lower item value and so on, until the total original value of the items adds up to 60% of the original contract amount.

Materially Unbalanced Bid. Bid that generates a reasonable doubt that award to the Bidder submitting a mathematically unbalanced bid will not result in the lowest ultimate cost to the Department.

Mathematically Unbalanced Bid. Bid containing lump sum or unit price bid items that do not reflect reasonable actual costs of labor, equipment, and materials, plus a reasonable proportionate share of the Bidder's anticipated profit, overhead costs, and other indirect costs.

Maximum Unit Weight or Maximum Density. Maximum value of the weight per unit volume established for a material.

MDOT Standard Plans. Drawings approved for repetitive use, showing details to be used where appropriate. The MDOT Standard Plans that apply to the project will be designated in the contract.

Median. The portion of a divided highway separating the traveled ways.

Michigan Registered Service Agency. Definition in MCL 290.602.

Minimum Pile Length. Length between pile cutoff elevation and the minimum pile penetration elevation shown on the plans.

Minimum Pile Penetration Elevation. Elevation shown on the plans that the bottom of piles must be driven to or below.

Net Prequalification. Current balance of the Bidder's established prequalification rating. The current balance is obtained by subtracting the uncompleted work on hand from the established rating.

Nominal Pile Driving Resistance. Nominal pile driving resistance measured during pile driving using the dynamic formula or dynamic testing methods in kips, as shown on the plans. Also see "Dynamic Formula" and "Dynamic Testing."

Non-Controlling Operation. An operation that, if the Contractor's expected rate of performance is not met or the scheduled start date is delayed, would not delay the opening to traffic or completion of the entire project. A non-controlling operation may be on or off the project site. The size of the

operation is not a factor in determining whether an operation is a non-controlling operation. Also see "Controlling Operation."

Notice of Award. Written notice to the Contractor that the contract has been awarded.

On-the-Job Training (OJT) Program. MDOT's OJT program meets the requirements of the Federal-Aid Highway Act of 1970 and 23 CFR Part 230, Subpart A. The objective is to develop skill improvement programs to provide opportunities for unskilled workers, particularly minorities, women, and disadvantaged persons, to acquire training in the skilled construction trades.

Ordered Pile Length. For timber piles, the Engineer will determine the ordered pile length. For cast-in-place concrete piles and steel piles, the Contractor will determine the ordered pile length.

Pay Item. Item of work in the contract. Also see "Major and Minor Pay Items."

Pavement Structure. All combinations of subbase, base course, and surface course, including shoulders, placed on a subgrade.

Performance Bond. The security furnished by the Contractor and the Contractor's surety to guarantee performance of the work in accordance with the contract.

Plan Grade. Vertical control grade shown on the plans.

Plan Quantity. Original contract quantity of a pay item.

Plans. Contract drawings that show the location, character, and dimensions of the prescribed work. Contract drawings also include the MDOT Standard Plans.

Practical Refusal. The nominal pile driving resistance value of 110% of the nominal pile driving resistance shown on the plans. Also see "Absolute Refusal."

Prebore Elevation. Elevation designated for stopping preboring, as shown on the plans.

Prequalification of Contractors. Process used by the Department to determine the work classifications that a Contractor is eligible to perform and the maximum contract amount that the Contractor's resources enables it to manage. The process is according to the MDOT *Administrative Rules Governing the Prequalification of Bidders for Highway and Transportation Construction Work*.

Production Piles. Piles other than test piles.

Progress Clause. The part of the proposal with the starting date, all intermediate and completion dates or the number of work days or both, and other restrictions or conditions.

Progress Schedule. Sequential listing of all of the controlling operations and the estimated time the operations will be controlling. The progress schedule is submitted by the Contractor after award and prior to starting work. It is reviewed and approved by the Engineer.

Project. The section of a highway or property on which the construction operation is to be performed as described in the contract.

Project Limits. The physical limits in the contract showing the points of beginning and ending of the work included in the project.

Proposal. Document with information on the project that is being advertised for bid. The information includes the location and description of work, schedule of items, progress clause, bid guaranty amount, date and time for electronic submission and downloading of bids, Special Provisions, Supplemental Specifications, or other requirements that may vary from or that are not contained in the Standard Specifications or plans, and the applicable wage rates to be paid by the Bidder.

Qualified Products List. List of materials that have been prequalified for use on projects.

Redrive. Pile driving beyond 3 inches or beyond the first 20 blows, whichever occurs first, after the end of drive.

Restrike. Pile driving to move the pile an additional 3 inches or the first 20 blows, whichever occurs first, after the end of drive.

Right-of-Way (ROW). General term denoting land, property, or interest therein acquired for or devoted to a highway, as shown on the plans.

Roadbed. Portion of the roadway between the outside edges of finished shoulders or the outside edges of berm immediately back of curbs or gutters, when constructed.

Roadside. Portion of the right-of-way outside the roadway.

Roadway. Portion of the right-of-way required for construction, limited by the outside edges of slopes and including ditches, channels, and all structures pertaining to the work.

Seasonal Limitation. Time during which construction of work items will be suspended unless otherwise specified in the contract.

Seasonal Suspension. Period from November 15 through April 15 unless specified otherwise in the contract.

Segregation. Areas of non-uniform distribution of material components that are visually identifiable or can be determined by other methods.

Shoulder. Portion of the roadway adjacent to the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses.

Sidewalk. Portion of the roadway constructed primarily for pedestrian use.

Specialty Classifications. Work classifications that the Department considers to require specialized equipment or crafts to an extent warranting being listed separately from the designated classification in the proposal.

Specifications. General term applied to all written directions, provisions, and requirements concerning the performance of the work.

- A. *MDOT Standard Specifications for Construction (Standard Specifications)*. All requirements and provisions contained in this book.
- B. Supplemental Specifications. Detailed specifications that modify and supersede the Standard Specifications.
- C. Special Provisions. Detailed specifications that modify and supersede the *Standard Specifications* and Supplemental Specifications, applicable to an individual project.

Spuds. Short, strong, driven members removed to make holes for inserting piles.

State

- A. The State of Michigan or the Michigan Department of Transportation Department, or both, when the State is the awarding authority;
- B. The County when a County is the awarding authority; or
- C. The Municipality when a City or Village is the awarding authority.

Station. When used as a definition or term of measurement, a station is 100 feet.

Subbase. Layer of specified material placed on the subgrade as part of the pavement structure.

Subcontractor. Individual or legal entity that performs part of the work through a contract agreement with the Contractor.

Subcontract. Written agreement between the Contractor and any individual or legal entity to perform a part of the contract work.

Subgrade. Portion of the earth grade upon which the pavement structure is placed.

Substructure. All of the structure below the bearings of simple and continuous spans, the skewbacks of arches, and the tops of footings of rigid frames, including backwalls, wingwalls, and wing protection railings; except backwalls designed integrally with the superstructure.

Superstructure. All of a structure not classified as substructure.

Surety. Legal entity or individual other than the Contractor executing a bond(s) furnished by the Contractor.

Surface Course. Top layer of a pavement structure.

Temporary Road. Roadway and appurtenances constructed to help the movement of highway and pedestrian traffic around a construction operation.

Temporary Route. Existing road over which the traffic is temporarily detoured around a construction operation.

Temporary Structure. Bridge, culvert, or grade separation constructed to maintain traffic during the construction or reconstruction of a bridge, grade separation, or culvert.

Test Pile. Pile driven at a location shown on the plans to determine pile driving characteristics. The Engineer will certify nominal pile resistance of a test pile using a static load test, dynamic formula, or dynamic testing methods.

Ton. Unit of weight equal to 2,000 pounds.

Traffic Control Devices. Signs, signals, lighting devices, barricades, delineators, pavement markings, traffic regulators, and all other equipment for protecting and regulating traffic in accordance with the *Michigan Manual of Uniform Traffic Control Devices* (MMUTCD), unless otherwise specified in the contract.

Traffic Lane. Portion of the traveled way used for the movement of a single line of vehicles.

Traffic Regulator. Person assigned to direct traffic, dressed and equipped as specified in the MMUTCD.

Traveled Way. Portion of the roadway designated for the movement of vehicles, exclusive of shoulders and auxiliary lanes.

Utility(ies). Properties of railway, telegraph, telephone, water, sewer, electric, gas, petroleum, cable television, and similar companies.

Waters of the State. "Groundwaters, lakes, impoundments, open drains, rivers, wetlands, streams and all other watercourses and waters, including the Great Lakes and their connecting waters, within the jurisdiction of this state [Michigan]" (MCL 324.3101(aa)).

Work. The furnishing of all labor, materials, equipment, and other items necessary to complete the project according to the contract. Work includes all alterations, amendments or extensions thereto, made by work order or other written orders of the Engineer.

Work Day (Working Day). All days when, as determined by the Engineer, it is possible for the Contractor to effectively carry out work on the controlling operation.

Work Day Contract. A contract in which the time required to physically complete the project or open it to traffic is designated by the number of work days.

Working Drawings. Supplemental design sheets or similar data that the Contractor may be required to submit to the Engineer. Examples include, but are not limited to, design calculations, stress sheets, shop drawings, erection plans, falsework plans, framework plans, cofferdam plans, and bending diagrams for reinforcing steel.

Work Order. Written order by the Engineer requiring performance by the Contractor.

Section 109. Measurement and Payment

109.01. Measurement of Quantities

The Engineer will determine quantities of materials furnished and of work performed under the contract by methods of measurement and computations that are generally recognized as conforming to good engineering practice. The Engineer will measure quantities of work completed under the contract according to United States standard measures.

Unless otherwise required by the contract, manufacturing tolerances established by the industries involved will be accepted.

When required by the Engineer, the Contractor must provide copies of paid freight bills, trucking slips, bills of lading, and paid invoices for any material used in the work. The Contractor and the Engineer will routinely review quantities during the life of the contract.

- A. **Payments Based on Plan Quantities.** If the contract requires payment of an item or part of an item on a plan quantity basis, the payments will be those quantities shown on the plans.

For earthwork, the basis for changes in quantities will include any demonstrated errors discovered in plan quantities.

If a Contractor believes that a plan quantity basis is inaccurate, the Contractor may request, in writing, that the Department check the identified quantity. The request must be accompanied by the Contractor's calculations, drawings, or other evidence indicating why the plan quantity is believed to be in error. If the plan quantity is in error, the Department will pay according to the corrected plan quantity, except as otherwise provided in subsection 103.02.

If the Department believes that a plan quantity is inaccurate, the Department will check the identified quantity. If the plan quantity is in error, the Department will pay according to the corrected plan quantity. If during construction, the Department finds that conditions have changed from those anticipated in design to the extent that actual measurement of a plan quantity item is warranted, the Department will measure the quantity and will base payment on the measured quantity.

- B. **Payments Based on Actual Quantities.** Unless specified otherwise, the basis of payment for a pay item will be the actual quantity. The Engineer will measure and calculate the actual quantity of work performed, using quantities from measurements taken from the completed in-place work in accordance with the "Measurement and Payment" subsection for the relevant pay item and the following:

1. **Linear and Area Measurements.** When the method of measurement specifies measurements in stations, miles, or acres, the measurements will be horizontal measurements, unless specified otherwise.

When the method of measurement for a particular item specifies that it will be measured in place, linear or area measurements will be taken at the surface of the completed item, parallel to the base.

2. **Volume and Weight Measurements.** All pay items specified to be measured as compacted-in-place will be measured in the field according to the subsection that applies to that material.

For all materials specified to be measured by the cubic yard, loose measure (LM) will be measured in the hauling vehicle at the point of delivery, unless specified otherwise. The Engineer's approval is required for all vehicles used for this purpose. The shape of the hauling unit must be such that the volume of the unit may be readily and accurately determined.

- a. **Aggregates.** The Engineer will make moisture determinations on aggregates on the dry basis using Formula 109-1.

$$Z = \frac{(X-Y)}{Y} \times 100 \quad \text{Formula 109-1}$$

Where:

X = Wet weight;

Y = Dry weight; and

Z = Percent moisture.

Measurement of pay quantities of aggregates on a ton basis when a maximum specified amount of moisture is allowed will be calculated as follows:

- i. When the actual moisture, including liquid admixtures, present at time of weighing does not exceed the maximum moisture content permitted, the actual scale weights will be used as pay quantities.
- ii. When the actual moisture present at time of weighing is more than the maximum moisture content permitted, the pay quantities will be calculated using Formula 109-2.

$$A = B \frac{100+C}{100+D} \quad \text{Formula 109-2}$$

Where:

A = Pay quantity of aggregate (tons);

B = Weight of wet aggregate (tons);

C = Allowable moisture (percent); and
 D = Actual moisture (percent).

3. **Measuring Wire and Steel Sheets and Plates.** The size of wire for electrical conductors will be measured according to ASTM B258.

When the term “gauge” refers to the measurement of steel wire, it means the wire gauge specified in ASTM A510/A510M.

The term “gauge,” when used concerning the measurement of steel sheets and light plates, means the gauge referenced in ASTM A568/A568M for uncoated sheet and in ASTM A653/A653M for a galvanized sheet.

4. **Measuring Depth of Reinforcement and Thickness of Concrete Pavement and Concrete Base Course.** The Engineer will core concrete pavements and concrete base courses before final acceptance to determine thickness of concrete pavement and, if required, the depth of reinforcement below the pavement surface in accordance with subsection 602.04.
5. **Measuring Thickness of Miscellaneous Concrete Construction.** The Engineer may core concrete construction when evidence shows nonconformance with the contract. The Engineer may core concrete construction on any portion or all of the work involved. Acceptance will be according to subsection 104.04.
6. **Measuring Weight on Scales.** Platform, belt conveyor, surge bin, and weigh batch scales, and associated weights, must conform to the requirements of the Weights and Measures Act (MCL 290.601 et seq.), and the requirements of the NIST Handbook 44, *Specifications, Tolerances and Other Technical Requirements for Weighing and Measuring Devices*.

Unless specified otherwise, enlist the services of a Michigan Registered Service Agency to certify the calibration and working order of the weighing system annually and whenever maintenance or repairs require restoring calibration.

A computer-generated printout system is required on platform, surge bin, and weigh batch scales. For concrete plant weigh batch scale systems, the ticketing system must conform to subsection 1001.03.A.4. For platform and surge bin scale systems, the ticketing system must print and identify all of the following information on a triplicate ticket for each truckload:

- a. Project number;
- b. Contractor's name;
- c. Type of material being weighed;
- d. Time;
- e. Date;
- f. Sequential, non-duplicate, ticket number (may be preprinted on a ticket);
- g. Gross weight;
- h. Tare weight;
- i. Net weight; and
- j. Net accumulated jobs daily total.

The information must be labeled so each ticket can be readily understood. The system must be interlocked to allow printing only when the scale has come to a complete rest.

109.02. Scope of Payment

The Department will pay the Contractor for accepted quantities of contract pay items at the contract unit prices, as required by the contract, except as otherwise specified in subsection 103.02.

The Contractor must agree to accept this compensation as full payment for the following:

- A. Performing the work; and
- B. Compensation for loss or damage arising from the nature of the work or from the action of the elements (except as specified in subsection 107.11) or from any unforeseen difficulties that may be encountered during the prosecution of the work.

109.03. Payments for Increased or Decreased Quantities

Whenever the quantity of any item of work as given in the contract is increased or decreased, payment for the item of work will be based on the quantity completed. The payment will be authorized at the unit price for the item named in the contract, except as otherwise provided in subsection 103.02.

109.04. Progress and Partial Payments

The Engineer will make progress payments for units of work completed and partial payments for delivered and stockpile materials. Payments will be made in a timely manner; however, no claim will be considered for delayed payment.

Progress payments do not constitute partial or full acceptance of the work. Acceptance of the work is specified in section 109.07.

A. **Completed Work.** The Engineer will make progress payments based upon estimates prepared by the Engineer of the work completed. The estimates are subject to final payment in accordance with section 109.07. Progress payments will be made every 2 weeks if all of the following occur:

1. The work is progressing according to the progress or critical path method schedule; and
2. The written directives of the Engineer and contract requirements are being fulfilled.

The final payment will be made according to the requirements specified under subsection 109.07.D.

B. **Delivered and Stockpiled Materials.** The Engineer may pay the cost of nonperishable materials that meet the contract requirements and that are produced, fabricated, or purchased for incorporation into the contract, including freight charges, when all of the following conditions are met:

1. The value of the delivered material to be used in one item of work exceeds \$3,000 and is not scheduled to be incorporated into the work within 30 days after delivery;
2. The Contractor presents a copy of proof of payment authenticated by the supplier or a copy of the supplier invoice related to the stockpiled material to the Engineer. If a copy of the supplier invoice is provided, the Contractor must furnish the paid invoice within 10 days after receiving payment from the Engineer. However, if the prime Contractor is the supplier, producer, or fabricator, the Engineer will base the payment on proven production cost; and
3. The Contractor stores or stockpiles the materials, in accordance with contract requirements or manufacturer's recommendations, on the project, at locations near the project or at the fabrication facility, as approved by the Engineer.

For materials stockpiled at locations not on the project or at locations near the project, the materials must have been approved by the Department for

shipment or for use. Fabricated materials required to be accepted by the Department based on "Fabrication Inspection" will still be accepted based on the two-part acceptance process shown in the *MQAP Manual*. Stockpiled material payment for fabricated items will be made in accordance with the Department's procedures.

The Engineer will base the payment for delivered or stockpiled materials on amounts paid to or invoiced by the supplier for the materials. However, the Engineer will withhold a portion of the contract unit price to cover completion of the work related to the pay item. The Engineer will not make payment for materials in excess of contract quantities. When the Engineer makes partial payment for materials, the Contractor must reserve the materials for use on the project. The Contractor is responsible for any loss or damage to the materials until the materials are incorporated in the work and the work is accepted.

The Contractor assumes the cost of any additional testing required by partial payment for stockpiling.

The Engineer's approval of partial payment for delivered or stockpiled materials will not constitute final acceptance of such materials for use in completing items of work.

When the Contractor provides receipted bills, paid invoices, or other satisfactory evidence of payment by the fabricator for structural steel raw material that is to be part of the completed structure and that has been produced by the steel mill and delivered to the fabricator, the Engineer will include the value of the steel in the progress estimate. Detailed descriptions of the delivered material, including weights, dimensions, heat and unit numbers, and chemical and physical test reports, must be shown on the invoice or supplied to the Engineer. The fabricator must store the material separately and use the material only for fabricating the structural steel for the contract.

The Contractor must present evidence that the producer, fabricator, or supplier of the material is fully aware of all details of the transaction.

The Contractor must immediately pay the fabricator for those materials upon receipt of payment by the Department.

If the fabricator notifies the Department that payment for materials paid for by the Department has not been received, and the fabricator's claim remains unsatisfied for more than 10 days following the Department's payment to the Contractor, the amount provided for payment to the fabricator will be deducted from the next progress estimate.

109.05. Payment for Contract Revisions

- A. **General.** The Department will pay for contract revisions, excluding those resulting from increased or decreased quantities of pay items covered by subsection 109.03, using the sequence specified in subsection 109.05.B through subsection 109.05.F. This payment covers all costs for performing the revised work, delay costs, and all other associated costs the Engineer deems reasonable and not expressly precluded in subsection 109.05.G. The Department may direct the Contractor, at any time, to perform the revised work under force account.

If a contract revision includes an extension of time for compensable delays under subsections 108.09.B.1 through 108.09.B.4, the Department will pay for delay costs in accordance with subsection 109.05.E

If a contract revision includes direction to the Contractor to accelerate the work in accordance with subsection 104.01.C, the Department will pay for the directed acceleration in accordance with subsection 109.05.F.

- B. **Contract Unit Prices.** The Engineer will attempt to price revised work using contract unit prices.
- C. **Negotiated Prices.** The Engineer and the Contractor will negotiate the price of a contract revision if the Engineer and the Contractor cannot agree on a price using contract unit prices.

The Contractor must provide an estimate of the proposed unit prices or lump sum price for the contract revision that includes the cost of performing the revised work, delay costs, and all other associated costs, plus a reasonable allowance for profit and applicable overhead. The Engineer may request that the Contractor justify the estimate by providing one or more of the following used in deriving the estimate:

1. Contractor's labor requirements, by trade, in hours for each task;
2. Contractor's equipment costs and time requirements;
3. Material costs; and
4. Any specialty subcontractor costs.

The Contractor must provide the justification within 5 calendar days after the Department's request. The Department will respond to the estimate within 5 calendar days after receipt of the Contractor's justification. The Department and the Contractor can mutually agree to extend these 5-day requirements.

D. Force Account.

1. **General.** If the parties are unable to reach agreement using contract unit prices or negotiated prices, the Engineer may direct the Contractor to perform the revised work, including any required offsite work, under force account.

The Department will pay the Contractor for the directed work as specified in this subsection. The Contractor must accept the compensation provided in this subsection as full payment for the directed work.

At the end of each work day, the Contractor's representative and the Engineer will compare records of the work done under force account.

At any point during the execution of a force account, both parties may mutually agree to return to payment for the revised work in accordance with subsection 109.05.B or subsection 109.05.C.

2. **Work Plan.** Before starting the force account work, the Contractor must submit a written proposal for the directed work, including the planned equipment, materials, labor, and schedule. The work plan must include, to the extent possible, a progress schedule of controlling items and their duration, equipment to be used (Contractor-owned and rented), labor to be used (number of people and crafts), and a list of material. The Engineer will review and approve the plan. From the work plan, the Engineer will prepare a budget recommendation for the force account work. If the conditions relative to the force account change or if the progress of the work becomes inconsistent with the original work plan, the Contractor and the Engineer will jointly revise the work plan.
3. **Labor.** The Engineer will pay the Contractor an amount equal to the sum of the following labor costs, plus 55% of the sum (for road work) or 60% of the sum (for bridge work), to cover the costs of home office overhead, bond premium, insurance, and payroll taxes and to provide for a reasonable profit.

For foreman and laborers, the Contractor will receive the rate of wage (or scale) that was agreed to in writing before beginning work. This rate will be paid for the time the foreman and laborers are engaged in the work. This will include hours required by a collective bargaining agreement or other employment contract applicable to the class of labor employed on the work, exclusive of time included in the "estimated operating costs."

The Contractor will receive the amount paid to, or on behalf of, workers for vacation benefits, health and welfare benefits, pension

fund benefits, or other benefits when the amounts are required by a collective bargaining agreement or other employment contract generally applicable to the classes of labor employed on the work.

For the superintendent, the amount the Contractor will receive will be limited to the work hours in which the superintendent is engaged in the performance of the work done under force account.

4. **Materials.** For materials used and accepted by the Engineer, the Contractor will receive the cost of materials delivered, including tax and transportation charges, plus 15%.

If a change in the amount or a change in the type of force account work results in a surplus of the material ordered and delivered to the project site, the Department will reimburse the Contractor for the costs, including restocking charges, incurred in returning the surplus material to the supplier.

Discount for prompt payment or penalty for late payment will not be considered in determining the cost of materials charged to the force account work.

5. **Equipment and Plant.** The Contractor will be paid according to the following for any equipment or special equipment, other than small hand or power tools, the use of which is approved by the Engineer. Exclusive of costs for the operator, the Department calculates the base hourly rate for a piece of equipment by adding two distinct components: a rental rate and an operating rate. The Department defines rental rate, operating rate, and base hourly rate as follows:

Rental Rate. Includes depreciation, taxes, major overhaul and repairs, overhead, interest, regional adjustment, equipment age adjustment, insurance, and storage.

Operating Rate. Includes fuel, lubricants, labor service and maintenance, field repairs, tires, and other expendable items needed for continuous and efficient operation.

Base Hourly Rate. The sum of a piece of equipment's rental and operating rates.

The cost of supplies, attachments not listed separately in the Equipment Watch's *Rental Rate Blue Book*, field and home office overhead, profit and incidentals, insurance covering the usual insurable risks, including fire and theft, are incidental to the base hourly rate. The Department will not be liable for losses that can be covered by insurance.

Upon request, the Contractor must furnish to the Engineer either original bills and invoices or certification documenting the equipment's original invoice price plus improvements. Payment for equipment will not exceed the equipment's original invoice cost plus any documented improvements. Cumulative payment for multiple force accounts for any piece of equipment on a single contract will not exceed the equipment's original invoice cost plus any documented improvements.

Time elapsed while equipment is broken down and being repaired will not be considered for payment. Time elapsed after the Engineer has advised the Contractor in writing that the equipment is no longer needed to complete the force account work will not be considered for payment except for transportation costs.

- a. **Contractor-Owned Equipment.** This subsection applies to the equipment and plant owned directly by the Contractor or by entities that are divisions, affiliates, subsidiaries, or in any other way related to the Contractor or parent company.
 - i. **Equipment Listed in Blue Book.** The published monthly rental rate for each piece of Contractor-owned equipment used, including appurtenances and attachments to equipment, will be determined by using the Blue Book. The edition that is current at the time the force account work is started will apply. The rental rate will be equal to the published monthly rental rate divided by 176, modified by the rate adjustment factor and the applicable map adjustment factor. The operating rate will be equal to the published estimated operating costs per hour.
 - ii. **Equipment Not Listed in Blue Book.** The monthly rental rate will be determined by using the published monthly rental rate listed for a similar piece of equipment giving proper consideration to the capacity, size, horsepower, and age of the equipment. The rental rate will then be determined by dividing the published monthly rental rate by 176, modified by the rate adjustment factor and the applicable map adjustment factor. The operating rate will be equal to the published estimated operating costs per hour. Rates must be agreed upon in writing before the equipment is used.

For equipment for which there is no comparable in the Blue Book, the Contractor will provide the monthly rental rate and operating rate and furnish cost data to support these rates. The monthly rental rate must be reasonable but not more than 5% of the invoiced cost of the equipment. The rental rate will

be determined by dividing the monthly rental rate by 176. Rates must be agreed upon in writing before the equipment is used.

- iii. **Small Tools.** No payment will be allowed for small hand and power tools that are not listed in the Blue Book. Small hand and power tools listed in the Blue Book at a rate of less than \$1.00 per hour will not be paid for separately.
- iv. **Foreman's Transportation.** The rate for the foreman's transportation unit will be \$25.00 per hour.
- v. **Minimum Equipment Time.** The minimum time per day for equipment used productively in force account work will be 2 hours.
- vi. **Equipment Transportation.** Travel time to the location of the force account work will be included when the equipment is moved under its own power. When equipment is moved from one site to another by means other than its own power, the actual operating time during periods of loading and unloading equipment will be paid for at the established base hourly rate, and transportation costs will be allowed.

Transportation charges for each piece of equipment to and from the work site will be paid provided:

- (a) Equipment is obtained from the nearest available source;
 - (b) Return charges do not exceed the delivery charges; and
 - (c) Charges are restricted to the units of equipment not already available and not on or near the project.
- b. **Non-Contractor-Owned Equipment.** If the Contractor is required to rent a specific type of equipment, the Contractor must inform the Engineer of the need to rent the equipment and provide a written estimate from the rental agency for that equipment before using it on the work site. The Contractor will be paid the actual rental cost plus the operating rate for the time the equipment is used to accomplish the work, plus the cost of moving the equipment onto and away from the job. The Contractor must provide a copy of invoices for all rental expenses incurred.
- c. **Standby Rate and Allowable Hours.** For Contractor-owned equipment, the standby rate will be one-half the rental rate established in subsection 109.05.D.5.a. The standby rate will only be allowed if the Engineer explicitly requires the equipment to remain on the site for later use on the force account work.

The Engineer will provide written notice when the equipment is no longer needed to complete the force account work and will not be considered for payment, except for transportation costs.

Payments for standby time will not be made on any day the equipment operates for 8 or more hours. For equipment accumulating less than 8 hours operating time on any normal work day, standby payment will be limited to only that number of hours that, when added to the operating time for that day, equals 8 hours.

6. **Subcontracting or Hiring Services by Others.** For administration costs in connection with subcontracting work or hiring services by others to perform specialized work that the Contractor is not qualified to do, the Contractor will receive an amount equal to 5% of the total cost of the work, computed as set forth above. Prior approval by the Engineer is required.
7. **Miscellaneous.** No additional allowance will be made for general superintendence or other costs for which no specific allowance is provided.
8. **Coordination of Records.** The Contractor's representative and the Engineer will compare records for work completed on a force account basis and bring these records into agreement at least once a week.
9. **Statements.** The Contractor will furnish the Engineer an itemized statement of the cost for the work performed on a force account basis including the percentage(s) added to labor, materials, and subcontracts. The Contractor must use a standard MDOT form or approved equal that includes the following details for reporting all force account costs.
 - a. **For Each Employee.** Name, classification, dates worked, time worked each day, total time worked on the force account activity, hourly rate of pay, total wages and fringe benefits, and total earnings to date.
 - b. **For Each Unit of Equipment Used.** Description, dates used, number of hours operated each day, standby hours, total hours, rental and operating rates, and total cost.
 - c. **For Materials Used.** Total quantities of materials used and material costs, including transportation. Statements must be supported by invoices for all materials used and transportation charges.

If materials used on the force account work are not purchased for specifically the work but are taken from the Contractor's stock, the Contractor must give the Engineer an affidavit certifying the following:

- i. The materials were taken from stock;
- ii. The quantity claimed was used; and
- iii. The costs including transportation represent the actual Contractor's cost.

E. Delay Costs

1. **General.** If the Contractor incurs a delay attributable to the Department, the Department will pay for the costs specified in this section as allowed by subsection 108.09.B, unless these costs have been previously paid as allowed in subsection 109.05.D. Such payment constitutes full compensation for the delay costs.

The Department will make no payment for delays occurring during seasonal suspension unless the Contractor's approved progress schedule depicts work on the controlling operation during this period or the Engineer directs the Contractor to work during seasonal suspension.

The Department will not pay for delay costs until the Contractor submits an itemized statement of those costs. Provide the content specified in subsection 109.05.D.9 for the applicable items in this statement and as follows:

- a. Proof of cost of project staff salaries, wages, payroll taxes, and insurance;
 - b. Proof of cost of field office overhead;
 - c. Proof of escalated cost for labor, equipment, and material; and
 - d. Proof of material storage costs.
2. **Allowable Delay Costs.** Increases in cost for labor, equipment, and materials will be calculated as follows:
 - a. **Idle Labor.** Labor costs during delays must be calculated as specified in subsection 109.05.D.3 for all non-salaried personnel remaining on the project as required under collective bargaining agreements or for other Engineer-approved reasons.
 - b. **Escalated Labor.** Payments authorized for increases in labor costs will be based on the difference between old and new labor rates established by a state or federal agency or an agreement

between the employee and Contractor's bargaining agency that is accepted by the Department. Payment will be based on certified payrolls. Payment will also include the increases in fringe benefit rates and increases in payroll taxes that the Contractor is required to pay.

- c. **Idle Equipment.** Payment may be allowed on a rental basis for the idled equipment if any one of the following criteria is met:
 - i. The equipment is on the project site at the time of the delay, is required for the controlling operation, and cannot be used at other locations on the project.
 - ii. The equipment is specialized and directly related to the controlling operation, whether on or off the project site. Both must be certified by the Contractor and verified by the Engineer.

The rental rate for idled leased or rented equipment will be the leased or rented rate. However, the Engineer may direct the Contractor to return equipment and take it off rental.

The rental rate for idled Contractor-owned equipment will be one-half the rate established in subsection 109.05.D.5.a. No payment will be allowed for operating costs.

Payment will be limited to the difference between the hours used and 8 hours in any one day and to the difference between the hours used and 40 hours in any one week. No additional compensation for overhead will be allowed.

Equipment demobilization and remobilization, if directed by the Engineer, will be paid in accordance with subsection 109.05.

- d. **Material Escalation or Material Storage.** Payment for increased cost of materials will be based on differences in the invoice costs before and after the delay period. When requesting an increase in cost of materials, the Contractor must document the increased costs due to the delay. The cost of materials storage during the delay will be the invoiced storage cost.
 - e. **Field Office Overhead.** Payment for field office overhead costs includes field office rent, office utilities, land rent, and office supplies. Compute these costs on a calendar day basis using actual costs incurred due to the delay.
- F. **Directed Acceleration.** If the Engineer orders the Contractor to accelerate the work in accordance with subsection 104.01.C, prior to

accelerating the work, the Engineer and the Contractor will negotiate compensation to the Contractor for the costs to accelerate the work.

- G. **Unrecoverable Costs.** The Contractor is not entitled to compensation for costs not specifically allowed or provided for in this subsection including, but not limited to, the following:
1. Loss of anticipated profit.
 2. Consequential damages, including loss of bonding capacity, loss of bidding opportunities, insolvency, and the effects of force account work on other contracts, or business interruption.
 3. Indirect costs.
 4. Attorney's fees, claim preparation expenses, and the costs of litigation.
 5. Unabsorbed or extended field or home office overhead or any damages using an Eichleay or similar equation, except as otherwise provided in the mark-ups specified in subsections 109.05.D.1 through 109.05.D.7.

109.06. Source of Supply and Carrier Rates on Materials

The following do not constitute cause for claim for extra compensation:

- A. The inability to secure satisfactory materials, for reasons beyond the Contractor's control, from the source upon which the bid was based, unless contract-specific single-source suppliers are specified by the Department; or
- B. Changes in carrier rates or the alteration of transportation facilities for these materials during the life of the contract.

109.07. Final Inspection, Acceptance, and Final Payment

- A. **Partial Acceptance.** Upon completion of a portion of the work, the Contractor may request, in writing, partial acceptance of that portion of the work. Within 7 days of the Contractor's written request, the Engineer will conduct an inspection to determine whether the Contractor has satisfactorily completed that portion of the work in accordance with the contract. Within 7 days of the inspection, the Engineer will provide written notice of either partial acceptance for that portion of the work and the effective date or an explanation for rejecting the Contractor's request for partial acceptance.

Partial acceptance will relieve the Contractor of maintenance responsibility and third-party damage liability for the designated portion of the work. By relieving the Contractor of maintenance and third-party

damage claims, the Department does not relieve the Contractor of responsibility for defective work or damages caused by the Contractor's operations. The Contractor must not construe partial acceptance to be final inspection, final acceptance of any part of the work, or waiver of any legal rights specified under section 107.

- B. **Delayed Acceptance.** Upon completion of contract work items designated for delayed acceptance, the Contractor must notify the Engineer, in writing, of the completion of the designated work. Within 7 days of the Contractor's written request, the Engineer will conduct an inspection to determine whether the Contractor has satisfactorily completed the designated portion of the work in accordance with the contract. Within 7 days of the inspection, the Engineer will notify the Contractor, in writing, of the date the delayed acceptance period begins.

Delayed acceptance will relieve the Contractor of maintenance responsibility and third-party damage liability for the designated portion of the work. By relieving the Contractor of maintenance and third-party damage claims, the Department does not relieve the Contractor of responsibility for defective work or damages caused by the Contractor's operations. The Contractor must not construe delayed acceptance to be final inspection, final acceptance of any part of the work, or waiver of any legal rights specified under section 107.

C. **Final Inspection and Final Acceptance**

1. **Final Inspection.** The Engineer will conduct the final inspection within 7 days of receiving the Contractor's written notification that the work is completed. The Contractor must attend the final inspection.

Within 7 days of the final inspection, the Engineer will provide written notice to the Contractor of a satisfactory final inspection or will provide a list of specific defects to be remedied in order to achieve a satisfactory final inspection.

After achieving satisfactory final inspection, the Contractor is relieved of the duty of maintaining and protecting the project. In addition, the Contractor is relieved of its responsibility for third-party damage claims and for damage to the work that may occur after satisfactory final inspection.

2. **Final Acceptance.** Within 7 days of satisfactory final inspection and submission of all required contract documentation by the Contractor, the Engineer will give the Contractor written notification of final acceptance effective on the date the Department executes MDOT Form 1120 *Final Inspection/Acceptance*.

The Contractor, without prejudice to the terms of the contract, is liable to the Department at any time, both before and after final acceptance, for latent defects, fraud, such gross mistakes as may amount to fraud, or actions affecting the Department's rights under any warranty or guarantee.

- D. **Final Payment.** Within 30 calendar days after final acceptance, the Engineer will prepare a final estimate of work performed. The Contractor will have 30 calendar days of issuance of the final estimate to file a claim or objections to the quantities within the final estimate. If no claim or objections are filed within 30 calendar days, the Department will process the final estimate for approval and final payment. At that time, the Contractor will be furnished a copy of the approved final estimate.
1. The final payment will be made when the Contractor has provided the following:
 - a. All reports or documents required by the Department and FHWA;
 - b. The consent of the surety for payment of the final estimate; and
 - c. Satisfactory evidence by affidavit, or other means, that all the indebtedness due to the contract has been fully paid or satisfactorily secured. If the evidence is not furnished, the Department may retain out of any amount due the Contractor sufficient sums to cover all lienable claims unpaid.
 2. The Department can recover from the Contractor in the final estimate all overpayments. However, no recovery for overpayment will be made if both of the following conditions exist:
 - a. The final estimate is issued more than 6 months after the acceptance of the project; and
 - b. The overpayment was paid to a subcontractor not in existence at the time of the final estimate.

Section 110. Mobilization

110.01. Description

This work consists of preparatory work and operations including, but not limited to, the following:

- A. The movement of personnel, equipment, supplies, and incidentals to the project site;
- B. The establishment of the Contractor's offices, buildings, and other facilities to support work on the project including associated job site posters;
- C. Other work and operations the Contractor must perform;
- D. Expenses incurred before beginning work on pay items at the project site; and
- E. Pre-construction costs, exclusive of bidding costs, that are necessary direct costs to the project rather than directly attributable to other pay items under the contract.

110.02. Materials

None specified.

110.03. Construction

All jobsite posters and employment notices required by state and federal regulations and the contract are to be posted in a conspicuous place. Posting of jobsite posters and employment notices (posted display, foreman vehicle binder, etc.) for short-term or mobile operations will be as approved by the Engineer.

110.04. Measurement and Payment

Pay Item	Pay Unit
Mobilization, Max (dollar)	Lump Sum

- A. The Department will specify the maximum bid amount for **Mobilization, Max (dollar)** in the proposal. If the Contractor submits a bid amount for **Mobilization, Max (dollar)** that exceeds the maximum bid amount, the Department will use the maximum bid amount as the Contractor's lump sum bid amount and will correct the total bid amount to reflect this maximum bid amount.

The Department will pay the Contractor for **Mobilization, Max (dollar)** in accordance with Table 110-1. The percent of the original contract amount earned does not include the **Mobilization, Max (dollar)** pay item.

Table 110-1: Partial Payment Schedule for Mobilization

Percent of Original Contract Amount Earned	Percent of Bid Amount for Mobilization, Max (dollar)
5%	50%
10%	75%
25%	100%

The first scheduled payment for **Mobilization, Max (dollar)** will not occur until the Engineer has verified and documented the posting of required jobsite posters and employment notices.

When the percentage of the original contract amount earned is less than 5% on the partial payment schedule, the Department will pay the Contractor for costs of project-specific bonding, insurances, and permits when proof of payment is received and accepted by the Engineer. The Engineer will then subtract these costs from the bid amount for **Mobilization, Max (dollar)**.

The total sum of all payments for this item will not exceed the bid amount for **Mobilization, Max (dollar)**, regardless of the following conditions:

1. The Contractor shut down the work on the project for any reason;
2. The Contractor moved equipment away from the project and then back again; or
3. The Department added additional quantities or items of work to the contract.

If the contract does not contain a **Mobilization, Max (dollar)** pay item, the unit prices for other items of work will include the costs of mobilization.

- B. If at any time during the project, the Engineer documents that the required jobsite posters and employment notices are not posted appropriately, the Engineer will provide documented instructions to the Contractor that corrective action is required. Upon receipt of the notification of corrective action, the Contractor has 72 hours to correct the deficiency. If the issue cannot be corrected within the 72-hour period, the Contractor will develop a documented implementation schedule for the corrective action and submit the schedule to the Engineer for approval within 72 hours of receiving the original documented notification. If the schedule is not approved, or if the schedule is approved but is not followed, the following actions will occur:
1. The Engineer may stop work on the project until the Contractor completes corrective action; and
 2. The Engineer will process a contract price adjustment in the amount of \$1,000 per calendar day or portion thereof that the corrective action remains incomplete or the implementation schedule is not followed. The contract price adjustment will continue to be assessed until jobsite posters and employment notices are posted appropriately, the Engineer has been notified of the corrective action, and the Engineer has verified the correction.

Section 203. Removing Drainage Structures, Culverts, and Sewers

203.01. Description

This work consists of removing or abandoning, in whole or in part, drainage structures, culverts, and sewers; salvaging, storing, and disposing of removed materials; and backfilling and compacting the excavated sites.

203.02. Materials

Provide materials in accordance with the following sections:

Sound Earth	205
Granular Material Class III	902

203.03. Construction

- A. **Drainage Structures.** When removing or abandoning a drainage structure, rebuild and reconnect live sewers through the removal area. Maintain service of live sewers during construction operations.

If the plans show abandoning a drainage structure, remove the cover and break down the masonry in accordance with subsection 204.03. Dispose of materials in accordance with subsection 205.03.P and backfill in accordance with subsection 204.03.C.

- B. **Culvert Pipe.** Completely remove pipe culverts as required, including end treatments.

Dispose of materials in accordance with subsection 205.03.P and backfill in accordance with subsection 204.03.C.

Remove only the portions of the existing culvert pipe necessary to allow connection to the new work when extending an existing culvert or replacing the existing end treatment. Do not damage the remaining culvert pipe.

Bulkhead abandoned culvert pipes in accordance with subsection 402.03.E or use other Department-approved methods. If the Engineer determines that the culvert is not in suitable condition for abandonment, the Engineer will specify alternate treatment.

For culvert pipes with a top elevation within 5 feet of the top of pavement and that require abandonment, review the abandonment treatment with the Engineer.

- C. **Sewer Pipe.** Remove sewers (storm, sanitary, or combined) or parts of sewers that require removal or that interfere with the new construction.

Dispose of materials in accordance with subsection 205.03.P and backfill in accordance with subsection 204.03.C.

Remove only the part of the existing sewer necessary to allow the required connection to the new work when extending existing sewers or incorporating existing sewers into the new work. Trim the connecting sewer pipe edges to meet the required lines and grades without weakening or damaging those parts of the remaining sewer.

Bulkhead abandoned sewers in accordance with subsection 402.03.E or use other Department-approved methods. If the Engineer determines that the sewer pipe is not in suitable condition for abandonment, the Engineer will specify alternate treatment.

For sewer pipes with a top elevation within 5 feet of the top of pavement and that require abandonment, review the abandonment treatment with the Engineer.

203.04. Measurement and Payment

Pay Item	Pay Unit
Dr Structure, Rem.....	Each
Dr Structure, Abandon	Each
Culv, Rem, Less than 24 inch	Each
Culv, Rem, 24 inch to 48 inch	Each
Culv, Rem, Over 48 inch.....	Each
Culv, End, Rem, Less than 24 inch.....	Each
Culv, End, Rem, 24 inch to 48 inch.....	Each
Culv, End, Rem, Over 48 inch.....	Each
Sewer, Rem, Less than 24 inch	Foot
Sewer, Rem, 24 inch to 48 inch	Foot
Sewer, Rem, Over 48 inch.....	Foot

- A. **General.** Unless otherwise required, the Engineer will measure structures or materials in the original positions.

The unit prices for the removal pay items include the cost of breaking down structures and material; sawing, removal, and disposal; providing, placing, and compacting backfill; and providing and placing replacement soil or base material.

The Department will pay for piling or timber cribs encountered during structure removal, but not shown on the plans, as extra work.

- B. **Drainage Structure, Removal and Drainage Structure, Abandon.** The unit prices for **Dr Structure, Rem, and Dr Structure, Abandon** include the cost of maintaining and reconnecting live sewers and of removing attached parts and connections.
- C. **Culvert, Removal and Culvert End, Removal.** The Engineer will measure elliptical or pipe arch culverts across the greatest dimension. The cost of removing existing end treatments, regardless of type, is included in the unit prices for the related culvert removal or culvert end removal pay items.
- D. **Removal of Pipes (Culverts, Sewers, Underdrains, etc.) with Diameters Less than 12 inches.** The cost of removing pipes, including culverts, sewers, and underdrains, with diameters less than 12 inches is included in the unit price for constructing the new structure, culvert, or sewer if portions of the existing pipe are within the excavation limits of a new structure, culvert, or sewer.
- E. **Abandoning Pipe Culverts and Abandoning Sewers.** The Department will not pay separately for abandoning pipe culverts and abandoning sewers.

Unless included in the unit price for abandoning drainage structures, the Department will pay for bulkheads greater than 12 inches that are required in abandoning pipe culverts and abandoning sewers as **Sewer Bulkhead** of the type required, in accordance with subsection 402.04.D.

- F. **Removal of End Treatments.** The Department will pay for removing end treatments on existing sewers as **Culv End, Rem.**

Section 205. Roadway Earthwork

205.01. Description

This work consists of the following:

- A. Constructing earth grades by excavating soil or rock and placing embankments or fills;
- B. Salvaging and stockpiling selected materials;
- C. Providing, placing, and compacting embankment materials;
- D. Trimming the earth grade;
- E. Disposing of surplus or unsuitable material; and
- F. Maintaining the work in a finished condition until accepted by the Engineer.

Earth excavation consists of the work to excavate materials not otherwise addressed in the contract as separate work items. Rock excavation and subgrade undercutting are separate work items.

Investigate local conditions before bidding in accordance with subsection 102.04. Boring logs shown on the plans are for information only. Refer to MDOT's *Geotechnical Manual* for detailed data on soils.

G. Definitions

CIP. When used with an embankment item, CIP denotes compacted-in-place.

Frost heave textured material. Material with more than 50% silt particles by weight and a plasticity index of less than 10.

Loose measure (LM). Refer to section 109.01.B.2.

Silt. Material with a particle size from 0.002 mm to 0.075 mm.

Sound earth. Natural homogeneous material composed of soil or aggregate that can be compacted to the required density, contains no visible organic material, and has a maximum unit weight of at least 95 pounds per cubic foot.

205.02. Materials

Provide materials in accordance with the following sections:

Granular Material Class II, III	902
Open-Graded Aggregate	902
Geosynthetics	910

Do not use foundry sand from metal casting for roadway earthwork.

Refer to MDOT's *Density Testing and Inspection Manual* for maximum unit weight and in-place density test methods.

205.03. Construction

Before beginning earth-disturbing activities, install soil erosion and sedimentation control measures in accordance with section 208.

The Department considers buried rubbish and trash not identified in the contract a differing site condition in accordance with subsection 103.02.C. All buried rubbish and trash that are found must be disposed of properly.

- A. **Preparing Roadway Foundation.** Remove material from the roadway foundation and salvage or dispose of. Compact the roadway foundation to the depth and density required.

Perform removal, salvage, and disposal operations in accordance with the following:

1. **Removing and Salvaging Topsoil.** Before removing topsoil, reduce vegetation to a height of 6 inches. Remove and dispose of cut vegetation, brush, rocks, and other unsuitable material.

Remove topsoil to the required depth from designated areas before excavating or placing embankment. Use equipment and methods that avoid lifting subsoil. Suspend topsoil removal if the Engineer determines that soil or weather conditions are unsuitable.

Submit a request to the Engineer in accordance with subsection 104.12 to temporarily stockpile topsoil inside the right-of-way.

Prior to temporarily stockpiling topsoil outside the right-of-way, obtain written permission from the owner of the property that has been designated for material placement and obtain required permits in accordance with subsection 208.03.A. Provide documentation to the Engineer before stockpiling topsoil. Do not stockpile temporarily or permanently in wetlands or floodplains.

Remove topsoil as follows:

- a. In peat and muck areas, do not remove topsoil;
- b. In borrow and clear vision areas, remove topsoil to the depth and width required;
- c. At inlet, outlet, and berm ditch areas, remove topsoil within the construction limits; and
- d. At roadway cut and embankment areas, remove topsoil within the limits of earth disturbance.

2. **Salvaging Materials.** Remove existing gravel, crushed stone, or selected excavated materials. The Contractor may salvage these materials. The Engineer may approve the use of salvaged materials to construct earth shoulders, approaches, or temporary roadway surfacing or to use in other work the Engineer determines appropriate. Do not salvage foreign or undesirable material. Temporarily stockpile salvaged material outside the limits of Contractor's earth disturbance and within the right-of-way limits, as approved by the Engineer.

Surplus salvaged material is the property of the Contractor. Dispose of surplus salvaged materials in accordance with subsection 205.03.P before project completion.

3. **Disposing of Stones, Broken Rock, and Boulders.** For materials that cannot be incorporated in the work, dispose of the materials in accordance with subsection 205.03.P.
- B. **Rock Excavation.** Excavate boulders with a volume of at least ½ cubic yard. Excavate rock or cemented soils that do not soften when wet or that cannot be removed without continuous drilling, blasting, or continuous use of a ripper or other special equipment.

Expose the surface of the rock to allow the Engineer to measure before starting rock excavation. Remove rock encountered in the excavation to the required cross section and in accordance with all of the following:

1. Excavate so no rock extends more than 6 inches above the lines of the required cross section;
 2. Excavate backslopes to the neat line slopes shown on the plans with no rock extending more than 12 inches from the true slope;
 3. Excavate the rock surface to provide drainage. Do not leave undrained pockets in the rock surface; and
 4. Remove rock or boulders loosened in the excavation and overhanging ledges on or outside the required cross section.
- C. **Peat Excavation.** Remove peat, muck, marl, and very soft underlying clay. Coordinate removal with swamp backfill operations.
- D. **Swamp Backfill.** Construct embankments across peat marshes as shown on the plans. Widen the embankment at culvert locations to provide a stable foundation for the length of the culvert, including headwalls and end sections. Provide granular material Class III for swamp backfill.

If total excavation of peat results in a reasonably dry trench as determined by the Engineer, the Engineer may allow backfilling as a separate operation. Backfill the reasonably dry trench immediately after completing

the excavation in accordance with the controlled density method in subsection 205.03.H.4.a. Perform excavation and backfill as separate operations in shallow peat areas only with the Engineer's prior approval.

Coordinate the rate of advancement of the embankment and surcharge in deep swamps with the rate of excavation of the upheaved peat. If a trench of the required depth is not maintained full width ahead of the surcharge, use additional peat-excavating equipment or stop construction of embankment and surcharge until the two operations are in balance.

Dispose of peat as shown on the plans or in accordance with subsection 205.03.P.

The Department will bore swamp backfill to determine whether unsuitable material has been completely excavated or displaced. If the borings show the presence of unsuitable material under the swamp backfill, the Department will determine the corrective action. The Department will complete borings and notify the Contractor of corrective actions within 60 days after completion of the swamp backfill.

Corrective action may consist of excavating, placing a surcharge, excavating relief trenches, or a combination of these actions.

If a surcharge is placed over the swamp backfill, the Engineer will determine the width and elevation. Leave the surcharge in place until the Engineer determines that the swamp backfill is stable or the required settlement has taken place. The Engineer may require that the surcharge remain in place for up to 90 days.

Material from the surcharge is the property of the Contractor.

Obtain the Engineer's approval for swamp backfill and complete peat excavation and spreading before placing the pavement structure.

- E. **Subgrade Undercutting.** Undercut the subgrade and backfill to replace material susceptible to frost heaving or differential frost action and to remedy unstable soil conditions.

Topsoil removal and peat excavation are not included in subgrade undercutting. Subgrade undercutting includes excavation below subgrade in cut sections, excavation at the transition from cut-to-fill sections, and excavation, other than peat excavation, as required below the topsoil in fill sections.

Excavated material from subgrade undercutting is the property of the Contractor.

1. **Limits of Subgrade Undercutting.** Excavate the subgrade to the approximate grade. The Engineer will promptly inspect the grade to

decide whether undercutting is necessary and to determine the limits of undercutting.

In shallow fill areas, the Engineer will inspect the fill area and determine the limits of the subgrade undercutting before the Contractor begins embankment placement.

Remove deposits of frost heave textured material within the subgrade surface limit. For areas north of the north boundary of Township 12 North, remove the frost heave textured material to a depth of 4 feet to 5 feet below the plan grade. For areas south of the north boundary of Township 12 North, remove the frost heave textured material to a depth of 3½ feet to 4 feet below the plan grade.

2. **Backfill of Subgrade Undercut.** Backfill subgrade undercutting Type I with selected clay or other Engineer-approved material.

Backfill subgrade undercutting Type II with granular material Class II.

Backfill subgrade undercutting Type III with the material excavated from subgrade undercut areas after mixing the excavated material to break up the undesirable strata of soils or with other Engineer-approved backfill material.

Backfill subgrade undercutting Type IV with 21AA dense-graded aggregate or 4G open-graded aggregate. Encapsulate 4G aggregate with geotextile separator.

Compact subgrade undercutting backfill to at least 95% of its maximum unit weight.

- F. **Subgrade Manipulation.** Scarify, mix, and blend the roadbed subgrade to a depth of 12 inches below the top of subgrade. Compact to at least 95% of its maximum unit weight.

- G. **Earth Excavation.** Excavated material is the property of the Contractor.

Compact the subgrade to at least 95% of its maximum unit weight and to a depth of at least 10 inches. If the subgrade cannot be compacted to 95% of its maximum unit weight using conventional construction methods, the Engineer may authorize the use of other methods to attain compaction.

In cut sections where the existing material appears to meet the requirements of subsection 301.02, excavate the grade to top of subbase rather than to the bottom of subbase. The Engineer will then determine whether the existing material meets subbase requirements. Shape material meeting subbase requirements to the top of subbase grade and compact to at least 95% of its maximum unit weight and to a depth of at

least 12 inches. The Engineer will adjust earthwork quantities accordingly. Excavate material not meeting subbase requirements to the bottom of subbase. The Department will not consider claims for damage caused by the Contractor's halting of grading operations so the Engineer can make subbase determinations.

Maintain the roadbed and ditches and provide drainage at all times. Install and remove temporary drainage facilities at no additional cost to the Department.

Perform grading to avoid removing or loosening material outside the required slopes. Replace and compact material removed or loosened outside the slopes to the required density and cross section.

Dispose of surplus or waste material resulting from ditch construction in accordance with subsection 205.03.P. Remove roots, stumps, or other materials that are unacceptable to the Engineer in the slopes and bottom of the ditch and backfill the holes with suitable material. Maintain ditches until the Engineer's final acceptance.

H. Roadway Embankment

1. **Stepping Side Slope.** Step embankments constructed on existing side slopes of 1:6 or steeper before placing embankment. Form steps with a horizontal dimension of at least 3 feet according to the *MDOT Standard Plan R-105* series.
2. **Borrow.** Borrow is defined in subsection 105.03. Excavate, transport, and place borrow material in accordance with subsection 105.03 and the following:

After removal of borrow, leave borrow areas free formed without rigid geometric shapes. Make side slopes as flat as practical but ensure that slopes are no steeper than 1:4. Round the tops and bottoms of slopes with vertical curves to blend into adjacent terrain. Grade overburden left in the borrow area, except topsoil, to eliminate unsightly mounds, as determined by the Engineer.

Where practical, shape borrow areas to drain, leaving usable land after completion. In granular soil, leave the area at least 12 inches above the high ground water level. In cohesive soil, leave the area at least 12 inches above the high-water elevation of the drainage outlet.

If the borrow area cannot be drained, create a pond or a wetland. Create ponds by excavating to a depth of at least 8 feet below normal ground water level in granular soil or to 8 feet below the lowest drainage outlet in cohesive soil. Create wetlands by excavation to the elevation directed by the Engineer.

Restore borrow areas as shown on the plans or in a manner that will leave the land in a useful condition and with a natural appearance. Restore borrow areas within the right-of-way as required by the contract. Fence ponded borrow areas unless otherwise directed by the Engineer.

Restore borrow areas outside the right-of-way in accordance with permit requirements covered by Part 91, Soil Erosion and Sedimentation Control, of the Natural Resources and Environmental Protection Act (MCL 324.9101 et seq.) and any land use agreements with the property owner.

The Engineer may allow boulders to remain in borrow areas if placement creates a natural appearance.

The Engineer may waive restoration requirements if the Contractor takes borrow from the working area of an existing commercial source or the property owner holds a permit from a county or municipal enforcing agency designated under Part 91, Soil Erosion and Sedimentation Control, of the Natural Resources and Environmental Protection Act (MCL 324.9101 et seq.) Provide the Engineer with a copy of the property owner's permit.

3. **Winter Grading.** The Engineer will determine the winter grading limits. Remove ice and snow from the ground surface before placing embankment.

Remove frozen material if the original ground contains more than 4 inches of frost within the limits of 1:1 slopes extending away from the finished shoulders to points of intersection with the original ground.

Remove frozen material on a partially complete fill before placing more fill on the embankment. Stockpile frozen material in areas approved by the Engineer and outside the limits of earth disturbance until thawed. Use the thawed material in the embankment if it meets moisture requirements at the time of use.

4. **Placing and Compacting Embankment.** After preparing the ground area, construct embankments with sound earth and stones, broken rock, concrete, or masonry, except within the top 3 feet of embankment, or as allowed in the disposal of peat excavation material in accordance with subsection 205.03.D and subsection 205.03.P. Do not place frost heave textured materials in the top 3 feet of embankment below subgrade surface. Use a uniformly textured material to construct the top 3 feet of embankment to a uniformly

stable condition. Provide at least 50 feet of longitudinal transition between two types of textured materials.

Deposit embankment materials and compact in accordance with the controlled density method. The Engineer may direct or approve the 12-inch layer method, rock embankment method, or methods for the treatment of peat marshes.

Construct embankments using methods that do not create an unstable slope condition. Do not block the drainage of granular material by placing impervious material on the outside of embankments or by placing a combination of pervious and impervious material in the embankment, creating potential pockets of saturated material. Do not place peat excavation material in upland areas between the 1:1 slope that extends down from the subgrade surface/front slope intercept point and the final plan fill slope in fills greater than 14 feet high.

The Engineer may allow the placement of uncovered stones within construction limits, broken concrete, and broken rock from rock cuts in embankments. Use stones, broken concrete, and broken rock with the largest dimension no greater than 12 inches. Place in layers. Fill voids with sound earth and compact to at least 95% maximum unit weight. Do not place stones, broken concrete, or broken rock layers within 3 feet of the subgrade surface.

When placing embankment in layers of the required thickness is not feasible (e.g., filling in water, constructing on poorly drained soil), the Engineer may allow construction of the embankment in one layer of granular material Class III and will determine the minimum elevation for equipment operation. Thoroughly compact the fill material. Above the granular material Class III elevation, construct the embankment in accordance with the controlled density method.

Backfill and compact embankment adjacent to structures in accordance with subsections 205.03.I and 206.03.B. Construct other embankment and backfill as follows:

- a. **Controlled Density Method.** Deposit cohesive material for embankments and spread in layers no greater than 9 inches deep, loose measure, and extending the full width of the fill area.

For granular material, attain the required density by depositing, spreading, and compacting in layers no greater than 15 inches deep.

Provide cohesive material with a moisture content no greater than 3% above optimum at the time of compaction. Provide granular material with a moisture content below saturation in accordance

with the one-point cone chart in MDOT's *Density Testing and Inspection Manual*.

Provide cohesive material in the top 3 feet of embankment with a moisture content not exceeding optimum at time of compaction. For material containing excess moisture, dry to the required moisture content before compacting. Ensure that each layer of material meets moisture requirements, and compact each layer to at least 95% of the maximum unit weight before placing the succeeding layer.

If the required percentage of maximum unit weight and the required moisture content are attained but the compacted material does not provide support for the subbase, the Engineer may direct the Contractor to dry the material by aeration and recompact. Aerate by disking or by manipulating the material using other methods approved by the Engineer.

- b. **Twelve-Inch Layer Method.** Deposit the material and spread in layers no greater than 12 inches deep, loose measure, parallel to the finished grade, and extending to the full width of the embankment. Deposit the material by operating the hauling equipment over the layer being placed. Compact each layer to at least 95% of its maximum unit weight in accordance with the 12-inch layer method test in MDOT's *Density Testing and Inspection Manual*.
- c. **Rock Embankment.** Use shattered rock from blasting or ripping with the largest dimension no greater than 12 inches to construct rock embankment. Deposit rock on the constructed fill and push over the leading edge to extend the fill. Do not deposit the shattered rock from the hauling equipment directly over the end of the fill. Place the rock embankment in layers no greater than 3 feet thick. Fill the surface of the rock embankment with rock fragments and rock fines to prevent infiltration of the earth embankment. Use granular material Class III to supplement insufficient rock fines to fill the surface of the rock embankment.

Do not use the aforementioned method in fills less than 4 feet deep. Do not place the stones and broken rock layers within 3 feet of the subgrade surface. For structures under rock embankment, provide at least 24 inches of granular material Class III along the sides and the top of structures before placing the rock embankment.

I. Structure Embankment

1. **Compaction of Original Ground.** In fill areas on which a structure is required, remove the topsoil from the area within the toes of slope in accordance with subsection 205.03.A.1. Compact the area to at least 95% of the maximum unit weight and at least 9 inches deep.
 2. **Placing Structure Embankment.** Place and compact structure embankment to the limits shown on the plans before casting overlying footings. Protect structure embankments from freezing until placement of overlying footings.
 - a. **Under Structure Footings Supported by Piling.** Construct structure embankment with granular material Class III within the limits shown on the plans. The Engineer may allow the use of sound earth as an alternate material when placed between April 1 and November 15. Use sound earth as defined in subsection 205.01 except that for rocks, the greatest dimension must be less than 3 inches. Deposit and compact structure embankment in accordance with the controlled density method.
 - b. **Under Structure Footings for Which Piling is Not Specified.** Construct structure embankment with granular material Class III within the limits shown on the plans and deposit and compact in accordance with the controlled density method. Compact structure embankment to 100% of the maximum unit weight within the limits of 1:1 slopes, extending outward and downward from the bottom edges of the structure footings.
 3. **Winter Grading for Structure Embankment.** Construct embankment during winter weather in accordance with subsection 205.03.H.3 except that before placing embankment to support a structure, remove ground containing frost within the limits of 1:1 slopes spreading outward in every direction from the bottom edges of structure footings. Stockpile frozen material until thawed outside the limits of earth disturbance in areas that are approved by the Engineer.
- J. Machine Grading.** Machine grading consists of light grading, 12 inches deep, to develop the cross section shown on the plans and includes the following:
1. Scarifying;
 2. Plowing;
 3. Disking;
 4. Moving;

5. Compacting; and
6. Shaping the earth.

Loading or hauling material is not required for machine grading.

Grade ditches to drain runoff water. Grade intersections, approaches, entrances, and driveways as shown on the plans or as directed by the Engineer. Obtain the Engineer's approval before using excavation from ditches and roadbeds for shaping shoulders and adjacent fills.

- K. **Ditch Cleanout.** Perform ditch cleanout to a depth of no greater than 2 feet based on a typical cross section shown on the plans. Include the following work:
1. Remove cattails, brush, and miscellaneous debris;
 2. Remove trees with a diameter of less than 6 inches;
 3. Blend ditch profiles to match the existing ditch; and
 4. Remove soils/spoils from the project site.
- L. **Temporary Railroad Crossing.** Construct temporary railroad crossings in accordance with subsection 107.20.
- M. **Granular Blanket.** Excavate unstable soil in the slopes and backfill within the limits and to the depths shown on the plans or as directed by the Engineer. Dispose of excavated material in accordance with subsection 205.03.P.

For granular blanket, Type 1, backfill with granular material Class II.

For granular blanket, Type 2, dress the excavated area with a nominal 3-inch layer of granular material Class II before placing the drainage layer. Construct the drainage layer using one of the following:

1. A 2-inch layer of open-graded aggregate with geotextile blanket above and below;
2. A three-dimensional mesh with geotextile blanket above and below; or
3. Other geocomposite section approved by the Engineer.

Place at least a 12-inch layer of granular material Class II on the drainage layer to bring the slope and ditch section to the required elevation and cross section.

Construct underdrains adjacent to or as a part of the slope protection in accordance with section 404.

- N. **Trimming and Finishing Earth Grade.** Construct the earth grade to the required grade. Remove exposed stones and rocks with a diameter greater than 3 inches.

Trim the subgrade to the grade shown on the plans. If a subbase is required, trim the subgrade to within 1 inch of the required grade. If a subbase is not required, trim the subgrade to within $\frac{3}{4}$ inch of the required grade.

Trim and shape the earth grade outside the subgrade to the required lines, grades, and cross sections. Finish slopes to Class B tolerance unless Class A tolerance is required.

Finish Class A slopes to within 1 inch of the average slopes shown on the plans. Make measurements at right angles to the slope.

Finish Class B backslopes to within 6 inches of the average slopes shown on the plans. Make measurement at right angles to the slope. Do not leave abrupt variations in the finished surface. Remove debris and unsuitable material.

Finish Class B fill slopes to within $2\frac{1}{2}$ inches of the required grade and cross section from the outside shoulder line for 3 feet down the slope. Measure at right angles to the slope. Finish the remainder of the fill slope the same as a Class B backslope.

If trees or other obstacles do not interfere, round the tops of backslopes, bottoms of fill slopes, and other angles in the lines of the cross section to form vertical curves as shown on the plans or as directed by the Engineer. Make vertical curve transitions gradual such that they present a uniform and attractive appearance. The Contractor may omit vertical curves if constructing ditches in peat.

- O. **Channel Excavation.** Trim, straighten, widen, deepen, or relocate the channel of a stream or watercourse. Remove and dispose of excavated material. Remove masonry and concrete structures in accordance with section 204. Complete work in the new channel before diverting the stream flow to the new channel. Maintain channels and keep free from debris until final acceptance of the channel.
- P. **Disposing of Surplus and Unsuitable Material.** The Department assumes no legal obligation to ensure that the Contractor responsibly disposes of surplus and unsuitable material in accordance with this section. Permits must be obtained as necessary in accordance with subsection 107.02.
1. **Disposal Within the Right-of-Way.** Do not dispose of material, temporarily or permanently, beyond the normal plan fill slope across

regulated or unregulated wetlands or floodplains. The Engineer may allow disposal of material, including associated restoration material, within the right-of-way to fill low areas or flatten slopes at no additional cost to the Department.

2. **Disposal Outside the Right-of-Way.** Do not dispose of material, temporarily or permanently, in regulated or unregulated wetlands or floodplains. Prior to excavation, obtain written permission from the owner of the property including restoration requirements to be used for disposal outside the right-of-way and file the written permission with the Department. Dispose of material and restore areas in accordance with subsection 205.03.H.2 at no additional cost to the Department.
3. **Contractor Responsibility.** The Contractor is directly and solely responsible for disposal of surplus and unsuitable material.

Contact the appropriate regulatory agencies to determine whether an area is a regulated or unregulated wetland or floodplain before disposing of surplus or unsuitable material in areas outside the right-of-way and not shown on the plans as disposal sites.

Immediately move to an upland site any surplus or unsuitable material that was disposed of in portions of regulated or unregulated wetlands or floodplains not shown on the plans as disposal sites, at no additional cost to the Department. Restore the vacated area as directed by the applicable regulatory agencies at no additional cost to the Department.

The Engineer will not consider requests for extensions of contract time without an assessment of liquidated damages for delays associated with moving surplus or unsuitable material to an upland site.

4. **Notification to Regulatory Agencies.** The Department will notify the applicable regulatory agencies if the Department becomes aware that the Contractor disposed of surplus or unsuitable material in portions of a regulated or unregulated wetland or floodplain not shown on the plans.
- Q. **Berm Grading.** Remove existing earthen berms along shoulders of the roadway including under existing guardrail to facilitate drainage. Remove all berms from the paved shoulder to the hinge point of the fill slope and grade the slope to provide positive drainage or to the dimensions shown on the plans. Removed berm material, if approved for reuse, must be in accordance with subsection 107.15. Dispose of surplus or unsuitable material in accordance with subsection 205.03.P.

205.04. Measurement and Payment

Pay Item	Pay Unit
Excavation, Earth.....	Cubic Yard
Granular Material, CI ____	Cubic Yard
Excavation, Rock.....	Cubic Yard
Excavation, Peat.....	Cubic Yard
Backfill, Swamp	Cubic Yard
Subgrade Undercutting, Type ____	Cubic Yard
Subgrade Manipulation	Square Yard
Embankment, LM.....	Cubic Yard
Embankment, CIP.....	Cubic Yard
Embankment, Structure, CIP	Cubic Yard
Machine Grading	Station
Ditch Cleanout	Station
Granular Blanket, Type ____	Cubic Yard
Excavation, Channel.....	Cubic Yard
Berm Grading	Station

A. **Roadway Earthwork Volumes.** Prior to the start of the work, the Engineer and Contractor may agree to accept plan quantity, or the Engineer will calculate roadway earthwork volumes using the average end areas, the staked-section method, or an agreed-to alternative method.

The Engineer will determine the average end areas using the cross sections determined from the original and final elevation measurements. An alternative method such as a comparison of digital terrain models may be used if agreed to by the Contractor and the Engineer prior to the start of work.

For the staked-section method, the Engineer will calculate earthwork quantities by comparing the original cross sections taken before construction to the cross sections taken during and after construction.

The Engineer will take measurements during construction to verify conformance to the required grade and cross sections. The Engineer will adjust quantities for the following:

1. Changes in design;
2. Engineer-authorized deviation from the established grade and cross section;
3. Changes in original ground topography after the original survey was made; or

4. Any changes required by the Engineer during construction such as changing of cut or fill slopes and for excavation of peat, muck, marl, and very soft underlying clay.
- B. **General.** The cost to build, maintain, remove, and restore borrow haul routes is included in the unit prices for other pay items.

The Engineer will measure removed topsoil and other selected excavated materials from embankment areas as **Excavation, Earth**.

If the progress clause in the contract requires the Contractor to construct embankments during the seasonal suspension, the Department will pay for the frozen material that is removed and the embankment that is required to replace it at the unit price for **Excavation, Earth** and **Embankment** of the type required. The Engineer will direct the grading limits during the seasonal suspension.

The Department will not pay for removing topsoil and frozen material to facilitate the Contractor's operations.

The unit prices for other pay items include the cost of compacting existing material in embankment and cut sections after removing topsoil.

The Department will pay for the removal of masonry and concrete structures in accordance with section 204.

The Engineer will measure **Granular Material, CI II** and **Granular Material, CI III** in place. The Engineer will measure **Granular Material, CI III** required for constructing fills in water or constructing fills on poorly drained soil as **Backfill, Swamp**.

The Engineer will measure **Underdrains, Bank** in accordance with subsection 404.04.

The cost of trimming the subgrade and slopes to the required tolerances is included in the unit prices for other pay items.

The cost of restoring borrow and disposal areas is included in the unit prices for other pay items.

- C. **Excavation, Rock.** The Engineer will measure **Excavation, Rock** using the staked-section method with no allowance for overbreak. The Department considers overbreak the material removed outside the area shown on the plans or the Engineer-approved cross section for rock excavation.

The Engineer will not make deductions for rock projecting inside the lines of the cross section within the limits required.

The Engineer will measure boulders greater than $\frac{1}{2}$ cubic yard individually and will calculate the volume from average dimensions taken in three directions. The Department will pay for boulders greater than $\frac{1}{2}$ cubic yard as **Excavation, Rock**.

The Engineer will measure the removal of overburden as **Excavation, Earth**.

- D. **Peat Excavation and Swamp Backfill.** The Engineer will measure total **Excavation, Peat** in its original position.

For the measurement of partial **Excavation, Peat** and displacement, the Engineer will include the volume of the peat that is excavated to form the trench and the excavation of the upheaved peat in the trench. The Engineer will estimate the volume of upheaved peat required for removal from the trench at 100% of the actual peat displaced. The Department will not include peat displaced outside the pay limits shown on the plans in the pay quantity. The Engineer will take borings to determine the depth of displacement for calculating pay quantities.

The Department will pay for excavating peat, muck, marl, and very soft underlying clay as **Excavation, Peat**.

The unit price for **Excavation Peat** includes the cost of rehandling waste material to facilitate displacement.

In the treatment of peat marshes, the Department will not allow claims for delays lasting less than 60 days caused by Department testing and determination of corrective methods. Perform corrective work in areas requiring the total excavation method at no additional cost to the Department.

The Department and the Contractor will share equally the costs for corrective work in areas where the partial peat excavation and displacement method is required or directed by the Engineer. Payment for the corrective work includes excavation and relief trenches. If the Engineer recommends placement of a temporary surcharge, the Department will pay for half the swamp backfill quantity required for the surcharge. The Department will pay for half the quantity of swamp backfill removed as **Excavation, Earth** after the backfill stabilizes or the required settlement occurs.

If shown on the plans, the Department will pay for placement of temporary surcharge at the unit price for **Embankment, CIP** or **Backfill, Swamp**. The Department will pay for the removal of temporary surcharge at the unit price for **Excavation, Earth**.

The cost of maintaining a temporary surcharge, moved forward as the fill progresses, is included in the unit prices for other relevant pay items.

The Engineer will measure **Backfill, Swamp** in its original position. To facilitate measurement, isolate an area in the borrow pit or roadway cut as the exclusive source of material for **Backfill, Swamp**. If the Engineer requires more than initial and final cross sections to measure and calculate the volume of material removed, the Contractor must pay the Department for additional cross sections and calculations.

If not practical to calculate the volume of **Backfill, Swamp** in its original position, the Engineer will calculate the volume within the limits shown on the plans, or from fill borings, and increase the volume by 15%. The Engineer will not increase the **Backfill, Swamp** volume by 15% if the peat excavation results in a dry hole.

The Engineer will not increase the volume of **Backfill, Swamp** by 15% if the material is used to construct sand core fills regardless of whether sand core fills are shown on the plans or directed by the Engineer.

E. **Subgrade Undercutting and Subgrade Manipulation**

1. **Subgrade Undercutting.** The Engineer will measure **Subgrade Undercutting** in its original position. The Department will not make deductions to subgrade undercut quantities in areas where underdrain is installed.

The Department will not adjust the unit price for changes to the quantity of the type of **Subgrade Undercutting** required.

The unit price for **Subgrade Undercutting** of the type required includes the cost of removal and disposal of unsuitable material and replacement with required material.

Payment for geotextile separator required for 4G backfill will be paid for according to subsection 308.04.

2. **Subgrade Manipulation.** The Engineer will measure **Subgrade Manipulation** only in designated areas shown on the plans or directed by the Engineer.

F. **Earth Excavation and Embankment.** The cost of stepping side slopes is included in the unit prices for the related roadway embankment pay items.

1. **Embankment, LM.** The Engineer will measure **Embankment, LM** by volume, loose measure. The unit price for **Embankment, LM** includes the cost of providing, hauling, placing, and compacting material at the required locations.

2. **Excavation, Earth and Embankment, CIP.** Payment for **Excavation, Earth and Embankment, CIP** will be based on subsection 205.04.A.

If material is removed in embankment areas to a greater depth than required, the Department will pay only for the quantities of **Excavation, Earth; Embankment, CIP; and Embankment, Structure, CIP** as shown on the plans or as directed by the Engineer.
3. **Embankment, Structure, CIP.** The Engineer will measure **Embankment, Structure, CIP** based on the grade and cross section shown on the plans using the staked-section method. The Engineer will not make allowance for increases in quantities of fill material required due to normal consolidation of the natural ground under the embankment.

The Engineer will measure sound earth if used as structure embankment under pile-supported footings as **Embankment, CIP**.
- G. **Machine Grading.** The Engineer will measure **Machine Grading** along the surface edge. The Engineer will measure each side of the road where work is performed, separately.
- H. **Ditch Cleanout.** The Engineer will measure **Ditch Cleanout** along the center line of the ditch. Restoration will be paid for separately in accordance with section 816.
- I. **Granular Blanket**
 1. **Granular Blanket, Type 1.** The Engineer will measure **Granular Blanket, Type 1**, including the volume of granular material Class II, within the limits and to the depth shown on the plans or as approved by the Engineer.
 2. **Granular Blanket, Type 2.** The Engineer will measure **Granular Blanket, Type 2** in place and include the volumes of the drainage layer and granular material Class II within the limits and to the depth shown on the plans or as approved by the Engineer.
- J. **Channel Excavation.** The Engineer will measure **Excavation, Channel** by volume in its original position.
- K. **Berm Grading.** The Engineer will measure **Berm Grading** along the shoulder edge. The Engineer will measure each side of the road where work is performed, separately. The cost for berm grading under guardrail is included in this item. Grading under new or reconstructed guardrail is included in the unit price for the guardrail according to subsection 807.04.A.

Section 206. Excavation and Backfill for Structures

206.01. Description

This work consists of clearing, removing old structures or parts of structures, removing materials required for constructing structures, disposing of surplus or unsuitable material in accordance with subsection 205.03.P, and backfilling completed structures.

206.02. Materials

Provide materials in accordance with the following sections:

Sound Earth	205
Granular Material Class II	902
Aggregate, 6A, 46G	902
Geosynthetics	910

A. **Bridges, Pump Stations, Retaining Walls, and Culverts (Other Than Pipe).** Provide granular material Class II.

B. **Miscellaneous Structures.** Unless otherwise required, provide sound earth. Miscellaneous structures are structures other than bridges, pump stations, retaining walls, and culverts other than pipe.

206.03. Construction

A. **Foundation Excavation and Rock Foundation Excavation.** Excavate to allow for foundation unit construction. If shown on the plans or approved by the Engineer, trim the footing excavation to the exact size of the footing and omit the footing forms. For concrete placed on or against an excavated surface other than rock, do not disturb the bottom and side surfaces of the excavation before placing concrete. Excavate to the required grade immediately before concrete placement.

Before placing concrete, check the excavation depth and secure the Engineer's approval of the foundation support material. Place concrete in the absence of free-standing water. Change the elevations for the bottom of footings as directed by the Engineer to ensure a stable foundation.

If directed by the Engineer, remove and replace unsound material under proposed structures and replace with Department-approved material. Remove loose fragments and clean and cut rock surface or other hard material before placing concrete on required surface. Level, step, or serrate the surface as directed by the Engineer.

1. **Foundation Excavation.** Excavate materials, including portions of the existing structures, within the foundation excavation limits, except rock foundation excavation.

- 2. **Rock Foundation Excavation.** Excavate in accordance with subsection 205.03.B.
- B. **Backfill Placement and Compaction.** Place and compact backfill around completed structures.
 - 1. **Placing Backfill.** Provide material appropriate for the type of structure requiring backfill in accordance with subsection 206.02.

If soil that is excavated from the site meets material requirements, the Contractor may use it to backfill around completed structures.

Place backfill against the concrete structure after completion of the required curing, surface finishing, and waterproofing. Cover the inlet of each weep hole with geotextile blanket prior to placing backfill. Place backfill evenly around the structure to equalize horizontal loadings.

2. **Compacting Backfill**

- a. **Bridges, Pump Stations, Retaining Walls, and Culverts (Other Than Pipe).** Place backfill material in 6-inch layers. Compact each layer to 100% of the maximum unit weight in the load-bearing area. The load-bearing area is the area within the 1:1 slope, down and away from the outer limits of the bottom of the footing to the bottom of the excavation.

Place backfill behind and around substructure units, between the outer limits of the bottom of the footing and the surface elevation, in layers no greater than 12 inches deep. Compact backfill to at least 95% of the maximum unit weight.

Place backfill between the bottom of footing elevation and the bottom of slope paving subbase in layers no greater than 12 inches deep. Compact to at least 95% of the maximum unit weight.

- b. **Miscellaneous Structures.** For miscellaneous structures, place backfill in 12-inch layers and compact to at least 95% of the maximum unit weight. The Engineer may approve an increase in the thickness of layers if the Contractor obtains the required compaction results.

206.04. Measurement and Payment

Pay Item	Pay Unit
Excavation, Fdn	Cubic Yard
Excavation, Rock Fdn	Cubic Yard
Backfill, Structure, CIP	Cubic Yard
Backfill, Structure, LM	Cubic Yard

Aggregate Cubic Yard

A. **Excavation.** The Department does not consider excavation to include removal of ice, water, or liquids. Unless otherwise required, the cost of sheeting, shoring, and dewatering is included in the unit prices for related structure excavation pay items.

1. **Excavation, Foundation.** The Engineer will base payment for **Excavation, Fdn** on plan quantity in accordance with subsection 109.01.A. Unless otherwise shown on the plans, the Engineer will determine the plan quantities using the space bounded by the existing ground surface or exposed portions of the existing substructure, the elevation of the bottom of the foundation, and the 1:1 slopes extending outward and upward from points 18 inches outside the bottom of the footing.

The Department will pay for, as extra work, the removal of piling below the bottom of footing elevations that is not shown on the plans and encountered during structure excavation.

2. **Excavation, Rock Foundation.** The Engineer will measure **Excavation, Rock Fdn** in its original position for the amount of rock excavated within vertical planes through the footing neat lines. The Engineer will make allowance for overbreak if the Engineer determines that it is impractical to excavate to the neat lines of the footing. The Engineer will measure the amount of overbreak by actual cross sections of the footing excavation. Overbreak allowance is limited to vertical planes 6 inches outside and parallel to the neat lines of the footing and to a depth of 3 inches below the elevation of the bottom of the footing, as shown on the plans.

Excavation, Rock Fdn does not include removal of portions of existing structures.

B. **Backfill**

1. **Backfill, Structure, CIP.** The Engineer will base payment for **Backfill, Structure, CIP** on plan quantity in accordance with subsection 109.01.A regardless of the foundation excavation slope. The Engineer will not measure material placed outside the maximum pay limits shown on the plans.

The Department will pay for granular material Class II used to backfill bridges, pump stations, retaining walls, and culverts other than pipe as **Backfill, Structure, CIP.**

2. **Sound Earth.** The cost of sound earth used as backfill material for miscellaneous structures is included in the unit prices for related pay items.
3. **Aggregate.** The Engineer will measure **Aggregate** by volume, loose measure. The unit price for **Aggregate** includes the cost of providing, hauling, and placing 6A or 46G material at locations as directed by the Engineer.

Section 208. Soil Erosion and Sedimentation Control

208.01. Description

This work consists of installing and maintaining erosion and sedimentation controls to minimize soil erosion and control sediment from leaving the right-of-way and affecting water resources of the State of Michigan and adjacent properties. Complete this work in accordance with this section and MDOT's *SESC Manual*. The Department considers the terms "stabilization" and "erosion control measures" as defined in the *SESC Manual*.

Failure to install and maintain soil erosion controls may result in project shutdown, fines from the EGLE, or both. The Contractor is responsible for obtaining applicable federal, state, and local permits when disturbing areas outside a Department right-of-way or outside Department-acquired easement areas.

208.02. Materials

Provide materials in accordance with the following sections:

Coarse Aggregate, 6A.....	902
Granular Material Class II	902
Dense-Graded Aggregate, 21AA, 22A	902
Open-Graded Aggregate, 34R, 46G	902
Fencing Materials.....	907
Culvert Pipe	909
Geosynthetics	910
Cobblestone.....	916
Coarse Aggregate, 3x1	916
Riprap	916
Heavy Riprap	916
Sand and Stone Bags.....	916
Temporary Plastic Sheet	916
Turbidity Curtain.....	916

208.03. Construction

A. **Area Limitations.** Conduct work to minimize soil erosion.

Limit the area of earth disturbance to 50 stations of dual roadways or 100 stations of single roadway during clearing and grading. The Engineer may change the limits of exposed surface area based on the Contractor's ability to minimize erosion and prevent offsite sedimentation.

Do not disturb lands and waters outside the limits of earth disturbance within the right-of-way without prior approval from the Engineer. Restore

Contractor-disturbed areas beyond the plan or Engineer-approved limits at no additional cost to the Department.

Obtain and give the Engineer copies of local, state, or federally required permits before disturbing sites outside the right-of-way, such as borrow, waste or disposal areas, haul roads, or storage sites. Provide temporary and permanent erosion and sedimentation controls in accordance with the permits.

- B. **Time Limitations.** Bring grading sections to the final earth grade as soon as possible. Completion of the final earth grade does not include topsoil or other permanent restoration measures. The Engineer will consider the earth grade final and ready for placement of topsoil and permanent soil erosion control measures when the Contractor constructs a slope, channel, ditch, or other disturbed area in accordance with subsection 205.03.N.

Complete topsoil placement and stabilize slopes, channels, ditches, and other disturbed areas within 5 calendar days after final earth grade with permanent soil erosion control measures. Permanently restore and place topsoil on slopes and ditches within 150 feet of lakes, streams, or wetlands within 24 hours of achieving final earth grade using permanent soil erosion control measures.

Do not prolong trimming, finishing final earth grade, or both, to permanently stabilize the project at one time.

- C. **Construction and Maintenance of Erosion and Sedimentation Controls.** Construct temporary or permanent erosion and sedimentation controls in accordance with the *SESC Manual*, details shown on the plans, or as directed by the Engineer.

Maintain temporary erosion and sedimentation controls as necessary to ensure their effectiveness until permanent stabilization of the disturbed area has occurred. Dispose of sediment and debris removed from temporary sedimentation control devices in accordance with subsection 205.03.P.

Maintain permanent erosion controls as necessary to ensure their effectiveness until project completion and acceptance. Repair damaged areas, replace lost devices, and remove sediment as required. Dispose of sediment and debris removed from permanent sedimentation control devices in accordance with subsection 205.03.P.

1. **Check Dams.** Install, maintain, and remove check dams across ditches.

2. **Sediment Traps and Basins.** Excavate 5 cubic yards or less for sediment traps and greater than 5 cubic yards for sediment basins. Construct, maintain, and fill sediment traps and basins.

Prevent the excavated material from eroding into lakes, watercourses, or wetlands. Install required check dams downstream from a trap or basin before excavating the trap or basin.

3. **Filter Bag.** Provide, place, and remove at least 225-square-foot filter bags constructed of geotextile blanket. Pump water from the construction area into the filter bag to filter the water before it enters a watercourse. Install gravel filter berms on the downslope side of the filter bag for additional protection in sensitive areas or where the Engineer determines that the filter bag is not effectively removing the sediment. Place the filter bag in an upland vegetated area, on level ground, above, and as far as possible from watercourse banks. Use one pump discharge hose per filter bag. Hose must be of appropriate size for the filter bag. Use multiple filter bags as necessary to ensure effective filtration. The Engineer must approve the location of the filter bag before pumping begins.

Replace or dispose of the filter bag and its contents when no longer effective or required. Dispose of filter bag and contents in accordance with subsection 205.03.P.

The Contractor may discharge silt-free, sediment-free water directly to a watercourse.

4. **Sand and Stone Bags.** Provide, place, maintain, remove, and dispose of sand or stone bags. Use non-contaminated sediment-free materials. The stone from stone bags may remain in place after the required period if the bags are cut open and the stone spread evenly, as directed by the Engineer.
5. **Silt Fence.** Provide, install, maintain, remove, and dispose of silt fence consisting of woven geotextile fabric stapled to and supported by posts. Place material removed from trenching in the silt fence on the upslope side of the silt fence. In areas where water ponds behind the silt fence, provide a stone filter to channel away the water and prevent failure. Silt fence may remain in place after the required period if directed by the Engineer.
6. **Gravel Filter Berm.** Provide, place, maintain, remove, and dispose of gravel filter berms consisting of coarse aggregate 6A or open-graded aggregate 34R or 46G. Do not use a gravel filter berm instead of a check dam in a ditch.

7. **Inlet Protection, Fabric Drop.** Provide, place, maintain, and remove fabric drop inlet protection devices as directed by the Engineer. Remove and dispose of accumulated sediment as necessary.
 8. **Inlet Protection, Geotextile and Stone.** Provide, place, maintain, remove, and dispose of geotextile blanket, coarse aggregate 6A or open-graded aggregate 34R or 46G, or both, for inlet protection. Remove and dispose of accumulated sediment as necessary.
 9. **Inlet Protection, Sediment Trap.** Excavate, provide, maintain, remove, and dispose of sediment traps consisting of geotextile blanket and coarse aggregate 6A or open-graded aggregate 34R or 46G. Remove and dispose of accumulated sediment as necessary.
 10. **Temporary Plastic Sheets or Geotextile Cover.** Provide, place, maintain, remove, and dispose of plastic sheets or geotextile cover. Secure temporary plastic sheets or geotextile cover as directed by the Engineer.
 11. **Sand Fence.** Provide, maintain, remove, and dispose of fence to prevent sand from migrating onto roads.
 12. **Aggregate Cover.** Provide, place, maintain, remove, and dispose of geotextile separator and dense-graded aggregate 21AA, coarse aggregate 3×1, coarse aggregate 6A, or other Engineer-approved material.
 13. **Gravel Access Approach.** Provide, place, maintain, remove, and dispose of geotextile separator and coarse aggregate 3×1 or other Engineer-approved material.
 14. **Turbidity Curtain.** Provide, install, maintain, remove, and dispose of shallow or deep turbidity curtain.

Use shallow turbidity curtain when the water is no greater than 2 feet deep. Use deep turbidity curtain when the water is greater than 2 feet deep.

Provide a floating or staked turbidity curtain. During removal, minimize sediment loss.
 15. **Intercepting Ditch.** Construct and maintain intercepting ditches. Remove ditches when no longer needed or as directed by the Engineer.
- D. **Removal of Erosion and Sedimentation Control Facilities.** Remove or obliterate temporary erosion and sedimentation controls when the permanent controls are complete and approved unless otherwise directed by the Engineer. Do not remove temporary controls next to lakes,

watercourses, or wetlands until the establishment of turf on the adjacent slopes. Before placing topsoil, permanent seed, and fertilizer, remove or incorporate mulch placed for temporary erosion control into the slope. Minimize erosion and sedimentation into watercourses during removal of erosion controls. Repair damage caused during the removal of erosion controls at no additional cost to the Department.

208.04. Measurement and Payment

Pay Item	Pay Unit
Erosion Control, Check Dam, Stone	Foot
Erosion Control, Sediment Trap	Each
Erosion Control, Sediment Basin	Cubic Yard
Erosion Control, Filter Bag	Each
Erosion Control, Sand Bag	Each
Erosion Control, Stone Bag	Each
Erosion Control, Silt Fence	Foot
Erosion Control, Gravel Filter Berm	Foot
Erosion Control, Inlet Protection, Fabric Drop	Each
Erosion Control, Inlet Protection, Geotextile and Stone	Each
Erosion Control, Inlet Protection, Sediment Trap	Each
Erosion Control, Temp Plastic Sheet/Geotextile Cover	Square Yard
Erosion Control, Sand Fence	Foot
Erosion Control, Aggregate Cover	Square Yard
Erosion Control, Gravel Access Approach	Each
Erosion Control, Maintenance, Sediment Rem	Cubic Yard
Erosion Control, Turbidity Curtain, Shallow	Foot
Erosion Control, Turbidity Curtain, Deep	Foot
Ditch, Intercepting	Station

The Department will not pay for repairing or replacing temporary or permanent SESC measures damaged by the Contractor’s negligence. The Department will pay for repairing or replacing temporary or permanent SESC measures damaged by causes other than the Contractor’s negligence at the contract unit price for the relevant pay items.

- A. **Erosion Control, Check Dam, Stone.** The Engineer will measure **Erosion Control, Check Dam, Stone** in place. The unit price for **Erosion Control, Check Dam, Stone** includes the cost of providing, placing, maintaining, and removing the stone check dam.
- B. **Erosion Control, Sediment Trap or Basin**
 - 1. Erosion Control, Sediment Trap. The unit price for **Erosion Control, Sediment Trap** includes the cost of excavating, constructing, maintaining, and removing sediment traps.

The Department will pay separately for removing and disposing of accumulated sediment or debris from a sediment trap as **Erosion Control, Maintenance, Sediment Rem.**

2. **Erosion Control, Sediment Basin.** The Engineer will measure **Erosion Control, Sediment Basin** by volume, loose measure. The unit price for **Erosion Control, Sediment Basin** includes the cost of excavating, constructing, maintaining, and removing the sediment basin.

The Department will pay separately for removing and disposing of accumulated sediment or debris from a sediment basin as **Erosion Control, Maintenance, Sediment Rem.**

- C. **Erosion Control, Filter Bag.** The unit price for **Erosion Control, Filter Bag** includes the cost of providing, placing, maintaining, and disposing of the filter bag and its contents and restoring the filter bag site.

The Department will pay separately for gravel filter berm used in conjunction with a filter bag as **Erosion Control, Gravel Filter Berm.**

- D. **Erosion Control, Sand Bag and Erosion Control, Stone Bag.** The Engineer will measure **Erosion Control, Sand Bag** and **Erosion Control, Stone Bag** in place. The unit prices for **Erosion Control, Sand Bag** and **Erosion Control, Stone Bag** include the cost of providing, placing, maintaining, removing, and disposing of the sand or stone bags.
- E. **Erosion Control, Silt Fence.** The Engineer will measure **Erosion Control, Silt Fence** in place excluding overlaps. The unit price for **Erosion Control, Silt Fence** includes the cost of providing, installing, maintaining, removing, and disposing of the fence and posts.

The Department will pay separately for removing and disposing of accumulated sediment or debris from behind silt fence as **Erosion Control, Maintenance, Sediment Rem.**

- F. **Erosion Control, Gravel Filter Berm.** The Engineer will measure **Erosion Control, Gravel Filter Berm** in place. The unit price for **Erosion Control, Gravel Filter Berm** includes the cost of providing, placing, maintaining, removing, and disposing of the gravel filter berm.

G. **Erosion Control, Inlet Protection**

1. **Erosion Control, Inlet Protection, Fabric Drop.** The unit price for **Erosion Control, Inlet Protection, Fabric Drop** includes the cost of constructing, maintaining, and removing inlet protection fabric drops.
2. **Erosion Control, Inlet Protection, Geotextile and Stone.** The unit price for **Erosion Control, Inlet Protection, Geotextile and Stone**

includes the cost of constructing, maintaining, and removing geotextile and stone inlet protection.

3. **Erosion Control, Inlet Protection, Sediment Trap.** The unit price for **Erosion Control, Inlet Protection, Sediment Trap** includes the cost of excavating, constructing, maintaining, and removing sediment traps for inlet protection.

The Department will pay separately for removing and disposing of accumulated sediment or debris from a sediment trap inlet protection device as **Erosion Control, Maintenance, Sediment Rem.**

- H. **Erosion Control, Temporary Plastic Sheet/Geotextile Cover.** The unit price for **Erosion Control, Temporary Plastic Sheet/Geotextile Cover** includes the cost of constructing, maintaining, and removing temporary plastic sheets and geotextile covers.
- I. **Erosion Control, Sand Fence.** The Engineer will measure **Erosion Control, Sand Fence** in place. The unit price for **Erosion Control, Sand Fence** includes the cost of constructing, maintaining, and removing sand fence.
- J. **Erosion Control, Aggregate Cover.** The unit price for **Erosion Control, Aggregate Cover** includes the cost of constructing, maintaining, and removing aggregate cover.
- K. **Erosion Control, Gravel Access Approach.** The unit price for **Erosion Control, Gravel Access Approach** includes the cost of temporary culverts and ditching required to maintain existing drainage courses through or around gravel access approaches and providing, constructing, maintaining, and removing gravel access approaches.
- L. **Erosion Control, Maintenance, Sediment Rem.** The Engineer will measure **Erosion Control, Maintenance, Sediment Rem** by volume, loose measure. The unit price for **Erosion Control, Maintenance, Sediment Rem** includes the cost of removing sediment and debris from erosion and sedimentation control devices as required by the *SESC Manual* and as necessary to ensure their effectiveness.
- M. **Erosion Control, Turbidity Curtain.** The Engineer will measure **Erosion Control, Turbidity Curtain, Shallow** and **Erosion Control, Turbidity Curtain, Deep** in place. The unit prices for **Erosion Control, Turbidity Curtain, Shallow** and **Erosion Control Turbidity Curtain, Deep** include the cost of providing, installing, maintaining, and removing turbidity curtains.

The unit price for **Erosion Control, Maintenance, Sediment Rem** includes the cost of removing and disposing of accumulated sediment or debris retained by the turbidity curtain.

- N. **Intercepting Ditch.** The Engineer will measure **Ditch, Intercepting** in place along the ditch centerline. The unit price for **Ditch, Intercepting** includes the cost of constructing, maintaining, and removing the intercepting ditch.

Section 403. Drainage Structures

403.01. Description

This work consists of adjusting, constructing, or temporarily lowering drainage structures and cleaning existing drainage structures and leads as directed by the Engineer.

Drainage structures include manholes, catch basins, leaching basins, inlets, and drop inlets.

Drainage Structure. Includes concrete footing or precast sump. Used for access to new or existing sewers with a diameter no greater than 48 inches.

Manhole Base, Type 1 or Type 2, and Manhole Riser. Used for access to new or existing sewers with a diameter of at least 48 inches. Manhole Base Type 1 may be substituted for Precast Manhole Tees. **Precast Manhole Tee and Manhole Riser.** Used for access to new sewers with diameters of at least 42 inches.

Manhole Base, Type 1 or Type 2, and Manhole Riser. Used for access to new or existing sewers with a diameter of at least 48 inches. Manhole Base Type 1 may be substituted for **Precast Manhole Tees.**

403.02. Materials

Provide materials in accordance with the following sections:

Granular Material Class II, III	902
Steel Reinforcement	905
Miscellaneous Metal Products	908
Castings.....	908
Culvert, Sewer Pipe, and Box Sections	909
Geosynthetics	910
Masonry Units.....	913
Concrete, Grade 3000	1004
Mortar Type R-2	1005

Provide cast-in-place or precast concrete construction for sanitary sewer manholes.

Provide structural steel plate, at least ½ inch thick, for temporary lowering of drainage structures that span 72 inches or less. Verify that plates cover the entire drainage structure with a bearing surface of at least 12 inches. For plates that span greater than 72 inches, submit structural calculations prepared by a Professional Engineer licensed in the State of Michigan to the Engineer.

Provide leveling course hot mix asphalt (HMA) for patching during the temporary lowering operations or other HMA mixture as approved by the Engineer.

403.03. Construction

A. **Constructing, Adjusting, and Temporary Lowering of Drainage Structures, Precast Manhole Tees, Manhole Bases, and Manhole Risers**

1. **Excavation.** Excavate for constructing, adjusting, and temporarily lowering drainage structures, precast manhole tees, manhole bases, and manhole risers in accordance with subsection 206.03.A.
2. **Concrete Construction.** Construct concrete portions of drainage structures in accordance with subsection 706.03. Do not cast drainage structures if the concrete temperature is above 90°F.
3. **Placing Brick and Block Masonry.** Do not place masonry with mortar when the ambient air temperature is 36°F or less unless approved by the Engineer. Remove and replace work damaged by frost. Apply a ½-inch-thick plaster coat of mortar to the outer surface of structures and to the inner surface below the outlet flow line on catch basins with traps or sumps. Place the first set of bricks or blocks on a full bed of mortar. Lay brick or block in courses with uniform mortar joints ½ inch thick within ⅙ inch of depth. Stagger joints by half the length of the brick or block on adjoining courses. Place courses level unless otherwise required. Strike and point joints so the exposed surface is smooth. Rake joints and wet brick or block before placing the plaster coat. Allow the brick or block surface to dry to provide for proper bonding of the plaster coat.

Wet the brick. Allow the brick surface to dry to allow the brick and mortar to bond. Use of broken or chipped brick on the faces of the structure is prohibited. Provide a course made of headers at least every seventh course. Make closures with brick lengths no less than the width of a whole brick.

4. **Precast Reinforced Concrete Units.** Use poured-in-place concrete in accordance with subsection 403.03.A.2 or precast concrete footings. Construct precast reinforced concrete units in accordance with the contract. Seal the joints with mortar in accordance with subsection 403.03.A.3, or use butyl rubber sealant that conforms to ASTM C990. Support precast concrete footings on a 6-inch subbase of compacted granular material Class II.

5. **Steel Reinforcement.** Install steel reinforcement in accordance with subsection 706.03.
 6. **Inlet and Outlet Pipes.** Place and compact backfill around the manhole base or sump to provide bedding for inlet and outlet pipes.

Extend inlet and outlet pipes through the outside wall surface of the manhole a sufficient length to allow for pipe connections. Construct masonry around pipes and seal with mortar or other product approved by the Engineer to prevent leakage.
 7. **Backfilling.** Backfill in accordance with subsection 401.03.D.

Stage backfilling to coordinate with the construction sequencing of the structure as necessary.
 8. **Temporary Lowering of Drainage Structures.** Lower drainage structures before milling the pavement.

Record the location of the structure so each cover can be reinstalled at its original location. Remove the existing frames and covers and match mark them for later identification and placement. Salvage and safely store frames and covers. Repair the existing structure to allow uniform contact of the steel plate to the top of the structure. Place and compact the HMA for patching in accordance with section 501.
 9. **Protection during Construction.** Install inlet protection devices in accordance with section 208 and as approved by the Engineer when working around the drainage structure.
- B. **Drainage Structure Covers.** Provide and install new covers, including frames and grates, on new or existing structures as required. Place castings on a full mortar bed.
- C. **Adjusting Drainage Structure Covers.** Adjusting drainage structure covers applies when the new elevation of the cover requires a vertical change of no greater than 6 inches. Before placing the HMA top course or overlay, make final adjustments to drainage structure covers within the HMA pavement section if only applying one course. Adjust the cover to the required elevation by supporting it on one of the following:
1. Metal ring adjustor;
 2. Precast concrete adjusting ring;
 3. Masonry in a full mortar bed; or
 4. Alternate adjustor selected from the Qualified Products List.

Hold adjusted covers in place. Remove and replace the adjacent pavement, curb, or curb and gutter to match the existing grades or the required new elevations.

- D. **Additional Depth of Adjusting Drainage Structures.** Additional depth of adjusting drainage structure covers applies when a drainage structure cover is adjusted more than 6 inches from the existing cover elevation due to a change in elevation of the roadway or when alterations to the drainage structure exceed 6 inches regardless of the change in cover elevation. Remove damaged or unsound portions of the structure as directed by the Engineer and adjust as required.
- E. **Drainage Structure Taps.** Make connections to existing drainage structures owned by counties, municipalities, or drain commissions in accordance with the owner's regulations and the contract. If a conflict exists between the owner's regulations and these specifications, the owner's requirements take precedence.

If tapping an existing drainage structure, cut an opening into the receiving structure at least equal to the outside diameter of the inlet pipe plus 6 inches and insert the pipe. Pack a layer of mortar at least 3 inches thick around the inlet pipe and strike smooth with the inner wall of the receiving structure. Repair or replace existing drainage structure damaged by Contractor operations during tapping at no additional cost to the Department.

Tap directly to a sewer or culvert in accordance with subsection 402.03.D.

- F. **Cleanout.** Maintain catch basins, manholes, leaching basins, and inlets installed on the project. Ensure that installed catch basins, manholes, leaching basins, and inlets are free of silt, debris, and other deleterious material at the time of final acceptance.
- G. **Cleaning Existing Drainage Structures and Leads.** Before the Contractor starts work, the Engineer will determine the condition and identify the areas on the project that require cleaning of existing drainage structures and leads.

First, clean the downstream drainage structure nearest the trunk sewer and place a temporary bulkhead so the trunk sewer remains clear. Clean upstream drainage structures and leads only after cleaning and bulkheading the downstream drainage structure.

Clean the drainage structures and leads of sand, silt, and debris and prevent further contamination of the leads.

Dispose of the waste generated from the drainage structure or drainage structure lead cleanout operation using either Disposal Alternative A or Disposal Alternative B in accordance with this subsection.

If the Contractor suspects the waste generated is non-hazardous contaminated material or hazardous contaminated material, notify the Engineer. If testing shows the material is a hazardous waste as defined in Part 111, Hazardous Waste Management, of the Natural Resources and Environmental Protection Act (Michigan Compiled Laws [MCL] 324.11101 et seq.), immediately notify the Engineer.

1. **Disposal Alternative A**

- a. **Solid Waste Phase.** Solid waste disposal rules require that the waste have no releasable liquids. Dispose of the solid waste at a Type II landfill. The landfill may require testing before accepting the waste. Provide disposal documentation from the Type II landfill to the Engineer.
- b. **Liquid Waste Phase.** Dispose of the liquid waste using one of the following options:

Option 1 – Evaporate the liquid waste by use of drying beds, decanting stations, or similar systems that contain the solids during evaporation.

Option 2 – Place liquid waste in a sanitary sewer system with the sanitary sewer owner's approval. Provide a copy of the owner's approval to the Engineer.

Option 3 – Pump the majority of clear liquid from the drainage structure and leads without disturbing the solids. Discharge the clear liquid to:

- i. A sanitary sewer or combined sanitary and storm system with the sewer owner's approval;
- ii. The curb and gutter such that it re-enters and is completely contained within the storm sewer system and does not directly discharge into the waters of the state; or
- iii. An area of undisturbed, well-vegetated ground at a rate that does not result in excessive ponding, runoff, or soil erosion.

Dispose of the remaining solid and liquid phase as waste using Disposal Alternative A, either Option 1 or Option 2, or Disposal Alternative B.

2. **Disposal Alternative B.** Use a Licensed Liquid Industrial Waste Hauler to transport the waste generated and dispose of it in

accordance with Part 121, Liquid Industrial By-Products, of the Natural Resources and Environmental Protection Act (MCL 324.12101 et seq.). Provide the Engineer with a copy of the transport manifest.

403.04. Measurement and Payment

Pay Item	Pay Unit
Dr Structure, __ inch dia	Each
Dr Structure, Add Depth of __ inch dia, 8 foot to 15 foot	Foot
Dr Structure, Add Depth of __ inch dia, more than 15 foot	Foot
Drop Inlet, Type __	Each
Mh, Precast Tee, Cl __, __ inch	Each
Mh Base, __ inch, Type __	Each
Mh Riser	Foot
Dr Structure Cover, Type __	Each
Dr Structure Cover, Adj, Case __	Each
Dr Structure, Adj, Add Depth	Foot
Dr Structure, Tap, __ inch	Each
Dr Structure, Temp Lowering	Each
Dr Structure, Cleaning	Each
Dr Structure Lead, Cleaning, __ inch	Foot

- A. **Drainage Structures Excluding Drop Inlets.** The Engineer will measure the depth of drainage structures, with the exception of drop inlets, from the top of the masonry to the top of the concrete footing.

The unit price for **Dr Structure** of the diameter required includes the cost of concrete footing and no greater than 8 feet of the drainage structure depth. The unit price for **Dr Structure** includes the cost of temporary or final grade adjustments of the structure.

The unit price for **Dr Structure, Add Depth, 8 foot to 15 foot** of the diameter required includes the cost of drainage structure portions greater than 8 feet deep but no greater than 15 feet deep.

The unit price for **Dr Structure, Add Depth, more than 15 foot** of the diameter required includes the cost of drainage structure portions greater than 15 feet deep.

The unit price for new structures includes the cost of cleaning new drainage structures.

- B. **Drop Inlets.** The Engineer will measure drop inlets as units, of the type required, regardless of depth.

The Department will pay separately for pipe leading from the drop inlet to a sewer or catch basin. The cost of pipe from drop inlets, Type 1, is included in the unit price for related sewer pay items in accordance with

subsection 402.04. The cost of pipe from drop inlets, Type 2, as shown in the special detail, is included in the unit price for the related sewer pay item.

The Department will pay for a sewer tap or drainage structure tap in accordance with subsection 402.04 only if tapping the sewer or encased sewer into an existing drainage system is required.

- C. **Manhole Base and Riser.** The Engineer will measure **Mh Riser** vertically from above the collar of the **Mh, Precast Tee** or above the **Mh Base** to the top of the riser.

The unit price for **Mh Base, Type 1** includes the cost of cutting access holes in the sewer.

If the Contractor uses **Mh Base, Type 1** in place of **Mh, Precast Tee**, and the contract does not include the pay item **Mh Base, Type 1**, the unit price for **Mh, Precast Tee** includes the cost of installing a Type 1 manhole base.

- D. **Drainage Structure Covers.** When new covers are placed on existing structures, the Engineer will measure and the Department will pay for **Dr Structure Cover, Adj, Case ___** in addition to the new cover.

The unit price for **Dr Structure Cover, Adj, Case 1** includes the cost of the following:

1. Sawcutting existing pavement, curb, and curb and gutter;
2. Adjusting the cover up or down no greater than 6 inches; and
3. Removing and replacing pavement adjacent to the adjusted cover in accordance with the *MDOT Standard Plan R-37* series.

The Department will pay separately for removing and replacing curb and gutter adjacent to the adjusted structure.

The Department will pay only for **Dr Structure Cover, Adj, Case 2** for structure adjustments located outside existing pavement, curb, and curb and gutter.

The unit price for **Dr Structure Cover, Adj** of the case required includes the cost of repairs for uniform contact of temporary steel plate to the top of structures.

The Engineer will measure **Dr Structure, Adj, Add Depth** of the required diameter and depth beginning 6 inches from the level of the existing structure, in the direction of adjustment, to the limit of the additional adjustment depth. If the contract includes a pay item for **Dr Structure, Adj, Add Depth**, the contract will also include a pay item for **Dr Structure**

Cover, Adj of the case required. The unit price for **Dr Structure, Adj, Add Depth** includes the cost of drainage structure taps within the limits of the adjustment.

The Department will pay for drainage structure taps outside the limits of the adjustment as **Dr Structure, Tap**. The Department will pay for taps to existing sewers as **Sewer Tap** of the size required, in accordance with subsection 402.04.

- E. **Drainage Structure, Temporary Lowering.** The unit price for **Dr Structure, Temp Lowering** includes the cost of the following:

1. Match marking;
2. Removing, salvaging, and transporting castings to and from the site;
3. Storing the existing structure castings;
4. Plating the structure;
5. HMA patching; and
6. Removing the plate and HMA patching materials for final adjustment.

The Department will pay separately for the final adjustments to drainage structures. The unit price for **Dr Structure Cover, Adjust, Case 1** includes the cost of removing pavement to lower the structure.

The cost of repairs is included in the unit price for the related drainage structure adjustment pay item.

- F. **Cleaning Existing Drainage Structures and Leads.** The unit price for **Dr Structure, Cleaning** includes the cost of testing for disposal, hauling, and disposing of generated waste.

The unit price for **Dr Structure Lead, Cleaning** of the size required includes temporary bulkheads and the cost of testing for disposal, hauling, and disposing of generated waste.

The cost for cleaning out existing sewers, plugged by Contractor operations, is included in related pay items.

If not included in the contract, the Department will pay for disposal of non-hazardous contaminated material and hazardous contaminated material in accordance with subsection 109.05.

Section 803. Concrete Sidewalk, Curb Ramps, and Steps

803.01. Description

The work consists of constructing concrete sidewalks, curb ramps, and steps.

803.02. Materials

Provide materials in accordance with the following sections:

Sound Earth	205
Granular Material Class II	902
Curing Compound	903
Steel Reinforcement	905
Pipe Railing	908
Joint Fillers	914
Concrete, Grade 3000, 3500	1004
Grout	1005

- A. **Steps.** Use Grade 3500 for concrete for steps. Precast steps will be allowed.
- B. **Detectable Warning Surfaces.** Provide pre-fabricated detectable warning surfaces selected from the Qualified Products List that contrast visually with adjacent walking surfaces, either light-on-dark or dark-on-light. Base the selection on whether the detectable warning surface will be installed on existing concrete or on newly cast concrete. Ensure that the surface-applied products include mechanical anchors.

803.03. Construction

- A. **Preparation of Base.** Excavate to the required depth and to a width that will allow forming. Remove unsuitable material below the required depth and replace with sound earth. Shape base to conform to the section shown on the plans and compact to 95%.
- B. **Forms.** Use either fixed forms or slip forms. Provide straight, full-depth, unwarping forms that will resist springing during concrete placement. Firmly stake fixed forms.
- C. **Placing and Finishing Concrete.** Wet the base before placing concrete. Do not place concrete on a frozen base or on a base that is unstable from excessive moisture. Place the concrete and consolidate before finishing. Place and finish concrete in a continuous operation.

If replacing gutters in addition to curb ramps, transition the gutter cross section in advance of the curb ramp to meet the dimension and profile in

the *MDOT Standard Plan R-28* series. Use the same reinforcement pattern present in the existing gutter.

Place the railing sockets for concrete steps in the plastic concrete or drill into the hardened concrete.

Float the surface to produce a smooth surface, free from irregularities. Round the edges and joints with a finishing tool.

Texture the surface of sidewalks, curb ramps, driveways, and steps with a coarse broom transverse to the direction of travel.

Do not stamp, stencil, or in any way mark concrete with a company name, logo, or other such information.

- D. **Sidewalk Joints.** Construct transverse and longitudinal expansion and plane-of-weakness joints at intervals and locations shown in the *MDOT Standard Plan R-29* series. Align transverse joints with like joints in adjacent slabs. Construct joints with faces perpendicular to the surface of the sidewalk and no greater than $\frac{1}{4}$ inch from the position shown on the plans. Construct transverse joints at right angles to the centerline of the sidewalk and longitudinal joints parallel to the centerline.

Spade or vibrate and compact the concrete to fill voids at the faces of the joints.

Place expansion joint filler the full depth of the joint. Recess the top of the joint filler $\frac{1}{4}$ to $\frac{1}{2}$ inch below the finished surface.

Cut the plane-of-weakness joints into the concrete after floating. Cut plane-of-weakness joints to at least one-fourth the thickness of the sidewalk and from $\frac{1}{8}$ to $\frac{1}{4}$ inch wide.

Do not seal the joints.

- E. **Curing and Protection.** Cure and protect the concrete in accordance with subsection 602.03.M and subsection 602.03.T.
- F. **Railing for Steps.** Place the railing in the sockets and fill the space between the pipe and the socket with a non-shrink mortar or grout selected from the Qualified Products List. Provide bracing as needed for the railing to remain plumb while the grout achieves the proper strength.
- G. **Backfilling.** After the concrete gains the needed strength, remove fixed forms and backfill with sound earth. Compact and level the backfill 1 inch below the concrete surface.
- H. **Detectable Warning Surfaces.** Install detectable warning surfaces in accordance with the manufacturer's instructions and the *MDOT Standard Plan R-28* series.

- I. **Curb Ramp Opening.** Construct curb ramp openings in accordance with subsection 802.03, the *MDOT Standard Plan R-28* series, and as required to conform with the curb ramp geometry including, but not limited to, slopes, counter slopes, running slopes, cross slopes, flares, and widths.

803.04. Measurement and Payment

Pay Item	Pay Unit
Sidewalk, Conc, ___ inch	Square Foot
Curb Ramp, Conc, ___ inch	Square Foot
Detectable Warning Surface	Foot
Steps, Conc	Cubic Yard
Railing for Steps	Foot
Curb Ramp Opening, Conc	Foot

- A. **Concrete Acceptance.** Conduct concrete QC as specified in section 1002. The Engineer will conduct QA as specified in section 1003. The Department will apply adjustments to this work based on the QA results.
- B. **Sidewalk, Concrete.** The Engineer will measure **Sidewalk, Conc, ___ inch** of the required thickness, in place.
- C. **Curb Ramp.** The Engineer will measure **Curb Ramp, Conc, ___ inch** by the area of ramp and landing in place. **Curb Ramp, Conc, ___ inch** includes sidewalk sloped greater than the normal continuous sidewalk grades to meet the elevation of the curb opening or intermediate landing. Landing areas constructed and meeting the requirements of the *MDOT Standard Plan R-28* series will be included in the **Curb Ramp, Conc, ___ inch** item.

The unit price for **Curb Ramp, Conc, ___ inch** includes the cost of landings, monolithic rolled curbs or side flares along the longitudinal edges of the ramp or landing, and transitions to existing sidewalk.

The Department will pay separately for replacing sidewalks, curbs, or curb and gutter outside the area measured for **Curb Ramp, Conc, ___ inch**.

The Department will pay for rolled curb adjacent to the non-traffic edge of parallel or combination ramps separately only if the required height exceeds 18 inches along a continuous run.
- D. **Detectable Warning Surface.** The Engineer will measure **Detectable Warning Surface** in place by length along the center of the 24-inch-wide detectable warning surface material at required locations. The unit price

for **Detectable Warning Surface** includes the cost of surface preparation and application.

- E. **Steps, Concrete.** The Engineer will measure and the Department will pay for **Steps, Conc** based on plan quantities in accordance with subsection 109.01. The unit price for **Steps, Conc** includes the cost of foundation preparation; constructing forms; providing and placing steel reinforcement; providing, placing, finishing, and curing concrete; providing and placing backfill; and cleanup.

The Engineer will measure **Railing for Steps** in place by length of top rail for each railing required. The unit price for **Railing for Steps** includes the cost of providing, fabricating, installing, and grouting the railing.

- F. **Excavation and Backfill.** Unless the contract includes separate pay items for excavation and backfill, the unit price for other items of work will include the cost of excavation and backfilling.
- G. **Curb Ramp Opening, Conc.** The Engineer will measure **Curb Ramp Opening, Conc** in place along the joint between the curbing with the pavement including transitions to and from adjacent standard full-height curb and gutter cross section.

Section 816. Turf Establishment

816.01. Description

This work consists of conducting soil tests, preparing the soil, and placing sod or seed and mulch to permanently stabilize disturbed areas as shown on the plans.

A. Definitions

The following terms apply to this section.

Broadleaf Weed. Any dicotyledonous weedy plant. Broadleaf weeds include, but are not limited to, dandelion, clovers, thistles, and ragweed.

Compost. Mature, stabilized, humus-like material derived from the aerobic decomposition of yard clippings, leaves, and brush with a diameter less than 4 inches.

Dormant Seeding. Seeding placed in late November and December when plant growth ends for the season. Seeds are placed on unfrozen ground and mulched to lie dormant over the winter and germinate the following spring.

Friable. Easily crumbled or pulverized soil.

Friable Condition. Soil in a friable condition is a crumbled, pulverized, worked-up, loosened, or cultivated soil that is free of lumps and clods detrimental to seeding and sodding operations.

Humus. Brown or black material formed by the decomposition of vegetable or animal matter; the organic portion of soil, essential to fertility.

Hydromulching. Spraying mulch combined with water and mulch-anchoring material onto a prepared seed bed.

Hydroseeding. Spraying seed and fertilizer combined with water onto a prepared seed bed.

Muck. Organic matter consisting of decomposed plant material accumulated under conditions of excessive moisture. If organic remains are not identifiable as plant form, the material is considered muck.

Mulch. Material placed over seeding to improve germination by conserving moisture, moderating the soil temperature, and protecting the seed and soil from water and wind erosion.

Mulch Anchor. Glue-type material sprayed over mulch to hold it in place.

Peat. Organic matter consisting of partially decayed plant material accumulated under conditions of excessive moisture. If organic remains are identifiable as plant form, the material is considered peat.

Soil Test. Analysis report of soil nutrient content particle size, pH levels, and organic matter.

Soil Tracking. Horizontal grooves on exposed slopes 1:3 or greater parallel to the contour of the land using tracked construction equipment.

Target Weeds. Weeds the Engineer identifies for removal by spraying or other methods. Target weeds include any plant not included in the specified seed mix.

Turf Reinforcement Mat. Three-dimensional matrix of synthetic or a composite of synthetic and natural materials that is used to permanently control erosion.

816.02. Materials

Provide materials in accordance with the following sections:

Compost.....	917
Topsoil.....	917
Fertilizer	917
Seed	917
Sod	917
Mulch	917
Mulch Anchoring	917
Mulch Blankets.....	917
Turf Reinforcement Mat	917
Weed Control	917
Water	911

816.03. Construction

Establish turf in accordance with this section, the *MDOT Soil Erosion and Sedimentation Control Manual*, and as directed by the Engineer.

A. **Topsoiling.** Before placing topsoil, prepare the foundation. Provide, place, and spread humus bearing topsoil, compost, or both. Use topsoil from within the project limits or from off-site sources meeting the requirements in subsection 917.06. Obtain the Engineer’s approval for topsoil placement prior to seeding.

1. **Preparation of Earth Bed.** Seven to 10 days before preparing earth bed, including areas previously mulched or rye seeded for temporary

erosion control, kill existing vegetation by spraying with the non-selective herbicide containing glyphosate.

Construct the earth bed to the required grade and trim.

2. **Placing Topsoil.** Place topsoil meeting the requirements in subsection 917.06. Cover areas requiring seeding or sodding with topsoil, compost, or both, except for slopes constructed of topsoil, muck, or peat.

Spread topsoil, compost, or both on the prepared areas at least 3 inches deep. Pulverize large clods and lumps. Rake out rocks with a diameter greater than 2 inches, roots, litter, and deleterious material. Dispose of raked-out material in accordance with subsections 205.03.A.3 and 205.03.P.

Incorporate topsoil and compost into the upper 3 inches of the prepared earth bed. Do not work topsoil or compost if wet. Perform soil tracking prior to seeding on slopes steeper than 1:3. Leave horizontal soil impressions from equipment across the face of the slope, as required by Engineer and noted in the *MDOT Standard Plan R-96* series for soil erosion control measures.

3. **Excavated Topsoil or Salvaged Topsoil.** The Engineer will direct stockpiling excavated or salvaged topsoil within the right-of-way. Maintain the stockpile in a weed-free condition during the entire project duration.

- B. **Chemical Fertilizer Nutrient.** Provide and place fertilizer as indicated below.

In areas requiring sod, uniformly apply granular fertilizer before laying the sod.

In areas to be broadcast or drill seeded, uniformly apply granular fertilizer to the prepared seed bed.

Apply the required class of fertilizer to the required locations at the following application rates:

1. For Class A fertilizer, evenly apply 176 pounds of chemical fertilizer nutrient per acre on a prepared seed bed.
2. For Class B fertilizer, evenly apply 120 pounds of chemical fertilizer nutrient per acre on a prepared seed bed.
3. For Class C fertilizer, evenly apply 80 pounds of chemical fertilizer nutrient per acre on established turf.

If using the hydroseeding method, constantly agitate the seed-fertilizer mixture. Do not disk or harrow after placement. Apply fertilizer mixed with seed within 1 hour of mixing.

Remove excess fertilizer from impervious surfaces adjacent to prepared seed and sod beds by sweeping back into beds. Do not use water to flush excess fertilizer into storm drains or surface water. Do not use fertilizer within 15 feet of waters of the state or on frozen or saturated soil.

- C. **Seeding.** For each species, provide seed varieties selected from the Qualified Products List. Do not broadcast or hydroseed in conditions that would prevent seed placement as required. Apply turf and specialty seed mixtures in accordance with the mix ratios and seed rates in Table 816-1 and Table 816-2.

**Table 816-1:
General Roadside Seed Mix Selection Guide**

Turf Seed Mixture	Soil Type	General Location	Seed Rate	Salt Tolerance
TDS turf dry sandy	Dry sandy to sandy loam	Rural or urban	220 lb/acre	Low to medium
THV turf heavy soil	Heavy	Rural	220 lb/acre	Medium to high
TUF turf urban freeway	All types	Urban freeways, blvds., service roads, city streets	220 lb/acre	Medium to high
TGM turf medium to heavy soil	Medium to heavy	All	220 lb/acre	Low
THM turf loamy to heavy	Loamy to heavy	Residential and business turf	220 lb/acre	Low to medium

**Table 816-2:
Temporary Seeding Mixtures**

Seed Mixture	Soil Type	General Location	Seed Rate
CR cereal rye, <6 mos	All	All	70 lb/acre
TSM 6/24 temporary seeding, 6–24 months	All	All	100 lb/acre
TSM 24+ temporary seeding, >24 months	All	All	200 lb/acre

1. Permanent Seeding

- a. **Sowing.** When the seed bed has been properly graded, weeds have been eliminated, and the seed bed has been raked, harrowed, and tracked and is in a friable condition, sow seed with or following the application of fertilizer. Sow seed before applying

mulch. Sow or resow the seed mixture, providing uniform coverage at the rate specified in Table 816-1 or Table 816-2.

Sow using mechanical drills, hydroseeders, or by broadcasting. In areas with 1:4 slopes or flatter, use mechanical drills.

The Department will allow hydroseeding on slopes steeper than 1:4 as approved by the Engineer.

Empty the hydroseeder tank within 1 hour of introducing the seed and/or fertilizer to the tank. Dispose of tank contents that remain in the tank mixed with hydroseeder for longer than 1 hour.

Broadcast in areas requiring resowing or in areas not accessible to a drill or hydroseeder.

The Engineer will visually inspect areas sown for uniformity of application. Resow areas that do not have an average of two seeds per square inch at no additional cost to the Department.

- b. **Setting the Seed.** Lightly compact or rake areas sown by broadcast method to incorporate the seed into the top ½ inch of the topsoil. Immediately after setting the seed, mulch in accordance with subsections 816.03.E and 816.03.F.
2. **Temporary Seeding.** Obtain the Engineer's approval for temporary seeding. Place temporary seed only for erosion control or temporary soil stabilization. Do not temporarily seed slopes 1:3 or steeper after placing topsoil; permanently seed these slopes. Sow temporary seed in accordance with subsection 816.03.C.1. Before project completion, replace temporary seeding with permanent seeding as shown on the plans or directed by the Engineer.
3. **Dormant Seeding.** The Engineer will allow dormant seeding in limited areas. Obtain the Engineer's approval prior to dormant seeding. Dormant seed in accordance with subsection 816.03.C.1.
4. **Seasonal Limitations**
 - a. **Permanent Seeding.** Permanently seed the following locations during the specified periods:
 - i. Southern Lower Peninsula. South of the north boundary of Township 20 North; April 15 through October 10.
 - ii. Northern Lower Peninsula. North of the north boundary of Township 20 North; May 1 through October 1.
 - iii. Upper Peninsula. May 1 through September 20.

- b. **Dormant Seeding.** Dormant seed the following locations during the specified periods:
 - i. Southern Lower Peninsula. South of the north boundary of Township 20 North; after November 15 but not on frozen ground.
 - ii. Upper Peninsula and Northern Lower Peninsula. North of the north boundary of Township 20 North; after November 1 but not on frozen ground.
 - c. **Temporary Seeding.** Temporary seed in accordance with the seasonal limitations specified in subsection 816.03.C.4.a.
5. **Inspection.** The Engineer will inspect the seeded turf to ensure that the end result is well established, growing, and vigorous and contains the species required by the seeding mixture.

The Engineer will approve slopes as the Contractor completes permanent restoration on cut slopes, embankment slopes, or portions of slopes. The Engineer will consider each cut or embankment slope on each side of the roadway separately for approval.

Complete weed control in accordance with subsection 816.03.I.

- D. **Sodding.** Prepare the topsoil surface, provide and place the sod, and dispose of surplus material. Grade areas required for sodding to Class A slopes in accordance with subsection 205.03.N.

Immediately before laying sod, harrow the topsoil, at least 3 inches deep using a disk, spring tooth drag, spike tooth drag, or other equipment designed to condition the soil. Obtain the Engineer's approval for harrowing equipment. Harrow horizontally across the face of slopes.

Dampen the earth bed before laying the sod. Water the sod immediately after placement, in accordance with subsection 816.03.H. The Engineer will reject sod that has dried out.

Protect sod until placement. Lay sod within 24 hours after cutting. Do not handle sod with pitch forks or dump from vehicles. Do not place frozen sod or place sod on frozen soil. Unless otherwise approved by the Engineer, do not place sod in June, July, or August.

Place sod as shown on the *MDOT Standard Plan R-96* series. Stagger the transverse joints of the sod strips and lay parallel to the flow of water on slopes and in ditches. Place strips with tight joints. Lay sod starting at the base of the slope and work up the slope. Turn edges of sodded areas into the ground and cover with a layer of earth or shoulder material. Compact this material to allow the surface water to flow over the edge of

the sod. Butt the edges of sod firmly against, and level with, paved surfaces.

Work from ladders or treaded planks if necessary to prevent the displacement of sod during sodding operations. Compact sod by tamping immediately after placement. Tamp to a smooth, even surface free of bumps and depressions. Finish the sodded surface to a lawn-like appearance. On slopes steeper than 1:3, use wooden pegs to secure the sod. Space pegs no greater than 2 feet apart and drive flush with the sod surface.

- E. **Mulching.** Provide, spread, and anchor mulch material. Place mulch within 1 calendar day after seeding.

Do not mulch during winds that prevent placement and anchoring of the mulch.

Place mulch to allow sunlight to penetrate and air to circulate but thick enough to shade the ground, conserve soil moisture, and prevent or reduce water and wind erosion.

Spread mulch over the surface to a uniform thickness with an application rate of 2 tons per acre. If the Engineer allows dormant seeding, spread the mulch with an application rate of 3 tons per acre. After seed germinates and turf is established, apply herbicide in accordance with subsection 816.03.I.

Maintain the mulched areas and repair areas damaged by erosion, traffic, fire, or other causes before partial or final acceptance. Replace displaced mulch. Repair or replace damaged mulch areas at no additional cost to the Department, unless otherwise provided by subsection 107.11 or section 208.

Replace and anchor mulch that blows away or becomes displaced for reasons attributable to the Contractor, as directed by the Engineer and at no additional cost to the Department.

- F. **Mulch Anchoring.** Provide a mulch-anchoring material selected from the Qualified Products List. Spray mulch anchoring immediately after placing mulch. Do not spray if wind prevents the required placement of adhesive. Protect traffic, signs, structures, and other objects from the tackifier material. Immediately remove overspray.

Mix and apply latex base, recycled newsprint, wood fiber, guar gum, and other mulch-tackifier material according to manufacturer's recommendations or as follows:

1. **Latex-Base.** Mix 15 gallons of adhesive, or the manufacturer's recommended adhesive volume, whichever is greater, with at least 250 pounds of recycled newsprint and 375 gallons of water.
 2. **Recycled Newsprint.** Mix 750 pounds of recycled newsprint with 1,500 gallons of water.
 3. **Wood Fiber.** Mix 750 pounds of wood fiber with 1,500 gallons of water.
 4. **Guar Gum.** Mix 50 pounds of dry adhesive and at least 250 pounds of recycled newsprint with 1,300 gallons of water.
 5. **Other Tackifiers.** Mix 150 pounds of dry adhesive, or the manufacturer's recommended adhesive volume, whichever is greater, with at least 250 pounds of recycled newsprint and 1,300 gallons of water.
- G. **Mulch Blankets.** Provide, install, and anchor mulch blankets. Provide mulch blankets selected from the Qualified Products List. Place mulch blankets within 1 calendar day after seeding. Secure with net anchors. Place and anchor blankets in accordance with the minimum requirements specified in this subsection or the manufacturer's specifications, whichever is greater.

Overlap blanket edges by 2 inches and shingle lap blanket ends with a 6-inch overlap. Place net anchors along joint edges and blanket centerlines no greater than 2 feet apart. In waterways, shingle lap blankets with an overlap of 12 inches on the downslope edge. Place blankets on backslopes perpendicular to the roadbed. On foreslopes, lay the first strip adjacent to the road, parallel to the road. Lay the remainder of the strips on foreslopes parallel or perpendicular to the road. If installing blankets from the top of the slope, do not allow them to free fall down the slope.

1. **High Velocity Blankets.** Use high-velocity blankets on slopes of 1:2 or steeper and on ditch bottoms, including 12 inches up the front and backslopes.

The Contractor may substitute high-velocity blankets for mulch blankets at no additional cost to the Department.

2. **Mulch Blankets.** Use mulch blankets on slopes of less than 1:2 next to shoulders and behind curbs. Place mulch blankets with the netting on top and mulch fibers contacting the soil.

The Contractor may use mulch blankets only on ditch bottoms with ditch gradients no greater than 1.5%.

3. **Turf Reinforcement Mat (TRM).** Use TRMs for long-term erosion protection and to permanently reinforce vegetation on slopes, ditches, and shorelines.

Provide the manufacturer's published installation guidelines to the Engineer prior to installation. Install the TRM per the manufacturer's guidelines. Operation of equipment on the slope will not be allowed after placement of the TRM.

- H. **Water.** Provide and apply water in accordance with section 911 to sodded and seeded areas at the required rates. The Engineer may adjust watering based on the season and weather conditions.

1. **Sod**

- a. Water the earth bed with at least 3½ gallons per square yard before laying the sod;
- b. Apply at least 5 gallons per square yard after placing the sod;
- c. Apply an additional 5 gallons per square yard within 24 hours after placing the sod; and
- d. Apply 3½ gallons per square yard of sod, five times at 3- to 5-day intervals.

2. **Seed**

- a. Water seeded areas at 3½ gallons per square yard or as needed; and
- b. Continue watering regularly after germination begins in order to prevent seeds and seedlings from drying out.

- I. **Weed Control.** Provide mowing and/or apply herbicides as directed by the Engineer. Submit the name, label, Material Safety Data Sheets, and application rate of the herbicide to the Engineer and obtain the Engineer's approval before applying.

To apply herbicides, use a commercial herbicide applicator, licensed in the State of Michigan, and certified by the Michigan Department of Agriculture and Rural Development in the required category. Use application procedures and materials in accordance with federal, state, and local regulations.

Use equipment that is adequate in size to properly apply the herbicide in a timely manner and that meets federal, state, and local requirements.

Spray target weeds in the newly seeded turf after the new turf grass is established and will withstand herbicide application.

Target weeds must be eliminated within 14 to 21 days after spraying. Apply additional weed control if the first application does not eliminate all target weeds at no additional cost to the Department. Control target weeds until final acceptance.

Preserve and protect property adjacent to the roadway or work area from injury. Repair damage arising from acts or omissions in the performance of the work at no additional cost to the Department.

- J. **Mowing.** Maintain turf at 6 inches or less during construction and until final acceptance. Mowing to be paid for as Weed Control.
- K. **Acceptance.** Turf will be accepted when there is sufficient growth across 90% of the restored area to establish the turf bed and prevent soil erosion.

816.04. Measurement and Payment

Pay Item	Pay Unit
Compost Surface, Furn, LM.....	Cubic Yard
Compost Surface, Furn, __ inch	Square Yard
Topsoil Surface, Salv, LM	Cubic Yard
Topsoil Surface, Salv, __ inch	Square Yard
Topsoil Surface, Furn, LM.....	Cubic Yard
Topsoil Surface, Furn, __ inch	Square Yard
Fertilizer, Chemical Nutrient, CI __	Pound
Seeding, Mixture __	Pound
Sodding	Square Yard
Mulch	Square Yard
Mulch Anchoring	Square Yard
Mulch Blanket	Square Yard
Mulch Blanket, High Velocity	Square Yard
Turf Reinforcement Mat	Square Yard
Water, Sodding/Seeding	Unit
Weed Control.....	Acre

- A. **Compost.** The Engineer will measure **Compost Surface, Furn LM** at the source before hauling to the project.

The Engineer will measure **Compost Surface, Furn, __ inch** in place.

- B. **Topsoil.** The Engineer will measure **Topsoil Surface, Salv, LM** at the source before placement at the final location.

The Engineer will measure **Topsoil Surface, Salv, __ inch** in place.

The Engineer will measure **Topsoil Surface, Furn, LM** at the source before hauling to the project.

The Engineer will measure **Topsoil Surface, Furn, ___ inch** in place.

- C. **Fertilizer, Chemical Nutrient.** The Engineer will measure **Fertilizer, Chemical Nutrient, CI ___** of the type required by the weight of nutrient in the fertilizer. The Engineer will determine the weight of chemical fertilizer nutrient for payment using the following formula:

$$T = W \times \sum N \qquad \text{Formula 816-1}$$

Where:

- T = Weight of chemical fertilizer nutrients applied;
- W = Total fertilizer weight applied; and
- N = Percentages of nutrients contained in the fertilizer used.

- D. **Sod.** The Engineer will measure **Sodding** in place.
- E. **Mulching Material.** The Engineer will measure the following types of **Mulch Blanket** in place:
1. Excelsior mulch blankets;
 2. Straw mulch blankets;
 3. High-velocity excelsior mulch blanket; and
 4. High-velocity straw mulch blanket.

For straw mulch, provide the Engineer with tickets, in triplicate, at the time of delivery, showing the number of bales and weight of each load. Weigh the mulch on scales in accordance with subsections 104.01.F and 109.01.B.6.

The unit price for **Mulch** includes providing and spreading straw mulch at the rate shown on the plans. If the Engineer allows dormant seeding, the Department will pay for mulching it at 1.5 times the unit price for **Mulch**.

The unit price for **Mulch Blanket, High Velocity** includes the cost of providing, placing, and anchoring the blankets.

The unit price for **Mulch Blanket** includes the cost of providing, placing, and anchoring the blankets. If the Contractor substitutes **Mulch Blanket, High Velocity** for **Mulch Blanket**, the Department will pay for the substitution at the unit price for **Mulch Blanket**.

The Engineer will measure **Mulch Anchoring** in place. The unit price for **Mulch Anchoring** includes the cost of providing and spraying the tackifier.

- F. **Turf Reinforcement Mat.** The Engineer will measure **Turf Reinforcement Mat** in place. It includes the cost of providing, placing,

and anchoring mats. Overlapping of material will not be included in the measurement.

- G. **Water, Sodding, and Seeding.** The Engineer will measure water for sodding/seeding in units; each unit is equal to 1000 gallons.
- H. **Weed Control.** The Engineer will measure and pay for **Weed Control** in place 14 to 21 days after application.
- I. **Seeding, Mixture.** The Engineer will measure **Seeding, Mixture** of the type required, in pounds of seed applied.

Section 901. Cement and Lime

901.01. General Requirements

Provide facilities for sampling and inspecting cement at the mill, distribution point, and project. Store cement to allow access for inspection and identification of each shipment.

Ensure that Portland cement does not develop false set if tested by the mortar method specified in ASTM C359. The Department defines false set as occurring if penetration is less than 5 mm at 5-, 8-, or 11-minute intervals. The Department will apply these limits if difficulties arise from premature stiffening during the concrete placement or finishing.

Before concrete placement, provide the Engineer a copy of the Certification of Quality of Cement, as provided by the producer.

901.02. Testing

Cement and lime materials testing must be in accordance with the specified ASTM, AASHTO, or Department methods, as modified by this section.

901.03. Portland Cement

- A. **Type I, Type II, and Type III Portland Cements.** Type I, Type II, and Type III Portland cements must meet the requirements of ASTM C150/C150M. The requirements for time of setting by Gillmore Needle or Vicat Needle and the 7-day and 28-day compressive strength apply.
- B. **Blended Cements.** Blended cements must meet the requirements of ASTM C595/C595M.

901.04. Masonry Cement

Masonry cement must meet the requirements of ASTM C91/C91M, Type N, Type S, or Type M.

901.05. Hydrated Lime

Hydrated lime must meet the requirements of ASTM C207, Type S, or Type SA.

901.06. Slag Cement

Slag cement must meet the requirements of ASTM C989/C989M, Grade 100, minimum.

901.07. Fly Ash

Fly ash must meet the requirements of ASTM C618, Class F or Class C, except that the loss on ignition must not exceed 5% and the air-entraining admixture uniformity requirement in ASTM C168, Table 3 of Supplementary Optional Physical Requirements, applies.

901.08. Silica Fume, Dry-Densified

Dry-densified silica fume must meet the requirements of ASTM C1240.

Section 902. Aggregates

902.01. General Requirements

The Department may re-inspect and retest aggregates regardless of inspection at the producing plant. Provide safe access to the material for sampling from haul units or stockpiles.

Do not use spent metal casting foundry sand unless the contract expressly allows for its use.

Do not contaminate aggregate during loading or measurement.

902.02. Testing

Test aggregate materials in accordance with the following:

Material	Test
Wire Cloth and Sieves	AASHTO M92
Materials Finer than 75 mm (No. 200) Sieve in Mineral Aggregates by Washing	AASHTO T11
Specific Gravity and Absorption of Coarse Aggregate	AASHTO T85
Specific Gravity and Absorption of Fine Aggregates	AASHTO T84
Sieve Analysis of Fine and Coarse Aggregate	AASHTO T27
Sampling and Testing Fly Ash	ASTM C311/C311M
Organic Impurities in Fine Aggregate	AASHTO T21
Sieve Analysis of Mineral Filler	AASHTO T37
Mortar Strength	AASHTO T71
Particle Size Analysis	AASHTO T88
Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test	AASHTO T176
Uncompacted Void Content of Fine Aggregate	AASHTO T304
Sand Equivalent of Fine Aggregate	ASTM D2419
Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate	ASTM D4791
Water Asphalt Preferential Test	MTM 101
Los Angeles (LA) Abrasion Resistance of Aggregate	MTM 102
Insoluble Residue in Carbonate Aggregate	MTM 103

Sampling Aggregates MTM 107

Loss by Washing MTM 108

Sieve Analysis of Aggregate..... MTM 109

Deleterious and Objectionable ParticlesMTM 110

Aggregate Wear IndexMTM 111

Aggregate Wear IndexMTM 112

Selection and Preparation of Coarse Aggregate

 Samples for Freeze-Thaw TestingMTM 113

Making Concrete Specimens for Freeze-Thaw

 Testing on Concrete Coarse AggregateMTM 114

Freeze-Thaw Testing of Coarse Aggregate.....MTM 115

Crushed Particles in AggregatesMTM 117

Angularity Index of Fine AggregateMTM 118

Sampling Open-Graded Drainage Course

 Compacted in Place.....MTM 119

Dry Unit Weight (Loose Measure)

 of Coarse Aggregate MTM 123

Determining Percentage of Flat Particles,
 Elongated Particles, or Flat and Elongated
 Particles in Aggregate MTM 130

Determining Specific Gravity and Absorption of
 Coarse Aggregates MTM 320

Determining Specific Gravity and Absorption of
 Fine Aggregates..... MTM 321

A. **Definitions.** The Department uses the following terminology in the testing and acceptance of aggregates:

Base Fineness Modulus. Average fineness modulus typical of the source for a specific fine aggregate.

Cobblestones (Cobbles). Rock fragments, usually rounded or semi-rounded, with an average dimension between 3 and 10 inches.

Crushed Concrete Aggregate. Crushed Portland cement concrete.

Crushed Particles. Particles with at least one fractured face. The contract will specify the number of fractured faces based on required use. Unless otherwise specified, one fractured face is considered a crushed particle.

Iron Blast Furnace Slag. Synthetic nonmetallic byproduct simultaneously produced with pig iron in a blast furnace that consists primarily of a fused mixture of oxides of silica, alumina, calcium, and magnesia.

Manufactured Fine Aggregate. 100% crushed rock, gravel, iron blast-furnace slag, reverberatory furnace slag, or steel furnace slag.

Natural Aggregates. Aggregates that originated from stone quarries, gravel, sand, or igneous/metamorphic rock deposits.

Natural Sand 2NS and 2MS. Fine, clean, hard, durable, uncoated particles of sand free of clay lumps and soft or flaky granular material resulting from the natural disintegration of rock and used in concrete mixtures, mortar mixtures, and intrusion grout for pre-placed aggregate concrete.

Relative Density (oven dry [OD]). Specific gravity of aggregate that is dried or assumed to be dried. The aggregate is considered dried when it has been maintained at a temperature of $110 \pm 5^{\circ}\text{C}$ for sufficient time to remove all combined water by reaching a constant mass.

Reverberatory Furnace Slag. Nonmetallic byproduct of refined copper ore.

Salvaged Aggregate. Dense-graded aggregate or open-graded aggregate saved or manufactured from Department project sources that may consist of natural aggregate or blast furnace slag with particle sizes no greater than 2 inches and no visible organic or foreign matter.

Slag Aggregates. Byproducts formed in the production of iron, copper, and steel.

Soft Particles. Structurally weak particles or particles experiencing environmental deterioration, including shale, siltstone, friable sandstone, ochre, coal, and clay ironstone.

Steel Furnace Slag. Synthetic byproduct of basic oxygen, electric, or open-hearth steel furnaces that consist primarily of a fused mixture of oxides of calcium, silica, iron, alumina, and magnesia.

Stone Sand 2SS. Sand manufactured from stone sources. The sources must meet the physical requirements for coarse aggregate 6A prior to crushing. Stone sand in concrete base course or structural concrete is allowed only if not exposed to vehicular traffic.

902.03. Coarse Aggregates for Portland Cement Concrete

For coarse aggregates for Portland cement concrete, use Michigan Class 6AAA, 6AA, 6A, 17A, and 26A coarse aggregate produced from natural aggregate, iron blast furnace slag, or reverberatory furnace slag sources.

The Contractor may produce Michigan Class 6A, 17A, and 26A from crushed Portland cement concrete for uses specified in this subsection.

Ensure that the relative density (OD) falls within the limits established by freeze-thaw testing.

Provide coarse aggregates for Portland cement concrete in accordance with Table 902-1, Table 902-2, and this subsection.

- A. **Slag Coarse Aggregate.** Use slag coarse aggregate consisting of iron blast furnace slag or reverberatory furnace slag with a dry (loose measure) unit weight of at least 70 pounds per cubic foot in accordance with MTM 123.
- B. **Crushed Concrete Coarse Aggregate.** Use Department-owned concrete on the project to produce crushed concrete coarse aggregate. The Contractor may use crushed concrete coarse aggregate in the following concrete mixtures: curb and gutter, valley gutter, sidewalk, concrete barriers, driveways, temporary pavement, interchange ramps with a commercial average daily traffic (ADT) of less than 250, and concrete shoulders.

Do not use crushed concrete coarse aggregate in the following: mainline pavements or ramps with a commercial ADT greater than or equal to 250, concrete base course, bridges, box or slab culverts, headwalls, retaining walls, pre-stressed concrete, or other heavily reinforced concrete.

Avoid contamination with non-concrete materials, including joint sealants, hot mix asphalt (HMA) patching, and base layer aggregate or soil, when processing crushed concrete coarse aggregate. Limit contamination particles retained on the 3/8-inch sieve to no greater than 3.0%, based on a particle count of the total retained 3/8-inch aggregate particles. Aggregate stockpile contaminated with building brick, wood, or plaster will be rejected. Steel reinforcement pieces may remain in the stockpile if they can pass the maximum grading sieve size without aid. Ensure that the fine aggregate portion of the gradation does not exceed a liquid limit of 25.0% or a plasticity index of 4.0.

The Engineer will test the freeze-thaw durability of crushed concrete coarse aggregate for each project. After the Department's central laboratory receives the aggregate samples from the supplier, each test will require at least 3 months.

Crush concrete ensuring that it maintains uniform aggregate properties with no apparent segregation. The relative density (OD) must not vary more than ± 0.05 and absorption by more than ± 0.40 . Separate crushed concrete aggregate according to the original coarse aggregate type, except in the following situations:

1. If the weighed quantities of each aggregate type retained on the No. 4 sieve do not differ from the average quantities obtained from at least three representative samples by more than 10%; or
2. If using aggregate produced from concrete pavement with only one type of aggregate but repaired with concrete patches with a different aggregate type.

C. Aggregates for Optimized Gradation

1. Coarse Aggregate Requirements

- a. Coarse aggregate includes all aggregate particles greater than or retained on the $\frac{3}{4}$ -inch sieve.
- b. The physical requirements for the coarse aggregate are as specified in Table 902-1 and as follows:
 - i. High-performance concrete mixtures – Class 6AAA; and
 - ii. All other concrete mixtures requiring optimized gradation – Class 6AA.
- c. The maximum loss by washing (LBW) per MTM 108 is 2.0% for materials produced entirely by crushing rock, boulders, cobbles, slag or concrete; otherwise 1.0%.
- d. The maximum 24-hour soak absorption is 2.50%.

2. Intermediate Aggregate Requirements

- a. Intermediate aggregate includes all aggregate particles passing the $\frac{3}{4}$ -inch sieve through those retained on the No. 4 sieve.
- b. The physical requirements for intermediate aggregate are as specified in Table 902-1 for Class 26A.
- c. The maximum LBW per MTM 108 is 3.0%.

3. Fine Aggregate Requirements

- a. Fine aggregate includes all aggregates particles passing the No. 4 sieve.
- b. The fine aggregate must meet the requirements of subsection 902.08.

902.04. Chip Seal Aggregates

For single chip seal, use 34CS aggregate with a maximum moisture content in accordance with Table 902-8 and as described in MDOT's *Procedures for*

Aggregate Inspection, calculated in accordance with section 109 at the time of placement, and in accordance with Table 902-7 and Table 902-8.

For double chip seal, use CS-T aggregate with a maximum moisture content in accordance with Table 902-8 and as described in MDOT's *Procedures for Aggregate Inspection*, calculated in accordance with section 109 at the time of placement, and in accordance with Table 902-7 and Table 902-8.

902.05. Dense-Graded Aggregates for Base Course, Surface Course, Shoulders, Approaches, and Patching

When necessary, combine fine aggregate with natural aggregate, iron blast-furnace slag, reverberatory furnace slag, or crushed concrete to produce Michigan Class 21AA, 21A, 22A, 23A, and 23AA dense-graded aggregates in accordance with Table 902-1, Table 902-2, and this subsection.

The use of crushed concrete is prohibited on the project within 100 feet of any water course (stream, river, county drain, etc.) and lake regardless of the application or location of the water course or lake relative to the project limits.

Dense-graded aggregate produced by crushing Portland cement concrete must not contain more than 5.0% building rubble or HMA by particle count. The Department defines building rubble as building brick, wood, plaster, or other material. Pieces of steel reinforcement capable of passing through the maximum grading sieve size without aid are allowed.

Do not use Class 21AA, 21A, or 22A dense-graded aggregate produced by crushing Portland cement concrete to construct an aggregate base or an aggregate separation layer when the dense-graded layer drains into an underdrain unless at least one of the following conditions apply:

- A. A vertical layer of at least 12 inches of granular Class I, II, IIA, or IIAA exists between the dense-graded aggregate layer and an underdrain; or
- B. A geotextile liner or blocking membrane that will be a barrier to leachate is placed between the crushed concrete and the underdrain.

Produce Class 23A dense-graded aggregate from steel furnace slag for use only as an unbound aggregate surface course or an unbound aggregate shoulder.

902.06. Open-Graded Aggregates for Earthwork, Open-Graded Drainage Courses, and Underdrains

Use Michigan Class 4G, 34G, 34R, and 46G open-graded aggregates produced from natural aggregate, iron blast-furnace slag, or reverberatory furnace slag in accordance with Table 902-1 and Table 902-2. Class 4G may be produced from crushed concrete.

The use of crushed concrete is prohibited on the project within 100 feet of any water course (stream, river, county drain, etc.) and lake regardless of the application or location of the water course or lake relative to the project limits.

Open-graded aggregate 4G produced by crushing Portland cement concrete must not contain more than 5.0% building rubble or HMA by particle count. The Department defines building rubble as building brick, wood, plaster, or other material. Pieces of steel reinforcement capable of passing through the maximum grading sieve size without aid are allowed.

902.07. Granular Materials for Fill and Subbase

Use granular materials consisting of sand, gravel, crushed stone, iron blast-furnace slag, reverberatory furnace slag, or a blend of aggregates in accordance with Table 902-3 and this subsection.

The Contractor may make the following substitutions:

- A. Class I, Class IIAA, or Dense-Graded Aggregate 21A, 21AA, or 22A material for Class II material;
- B. Class I, Class II, Class IIA, Class IIAA, Class IIIA, or Dense-Graded Aggregate 21A, 21AA, or 22A material for Class III material;
- C. Class I material for Class IIAA material; and
- D. Dense-Graded Aggregate 21A, 21AA, or 22A material for Class IIA.

Do not use material with cementitious properties or with permeability characteristics that do not meet design parameters for subbase.

Granular material produced from crushed Portland cement concrete is not permitted.

The Engineer may allow the placement of granular material produced from steel furnace slag below the top 3 feet of the embankment and fill.

902.08. Fine Aggregates for Portland Cement Concrete and Mortar

Test for organic impurities in accordance with AASHTO T21. The aggregate must not produce a color darker than Organic Plate No. 3 (Gardener Color Standard No. 11). The Engineer may approve the use of fine aggregate that fails the test for organic impurities based on one of the following:

- A. The discoloration resulted from small quantities of coal, lignite, or similar discrete particles, or
- B. The tested concrete develops a relative 7-day strength of at least 95% in accordance with AASHTO T71.

Uniformly grade the aggregate from coarse to fine in accordance with Table 902-4. Fine aggregate 2NS, 2SS, and 2MS must meet fineness modulus requirements in Table 902-4.

Do not use crushed Portland cement concrete fine aggregate in concrete mixtures.

902.09. Aggregate General Requirements for HMA Mixtures

Use aggregate materials meeting the requirements of Table 902-5 and Table 902-6 for the HMA mix number and type required, respectively.

- A. **Coarse Aggregates.** For HMA mixtures, use natural aggregate, iron blast-furnace slag, reverberatory furnace slag, steel furnace slag, or crushed concrete as coarse aggregate.
- B. **Fine Aggregates.** For HMA mixtures, use natural aggregate, iron blast-furnace slag, reverberatory furnace slag, steel furnace slag, manufactured fine aggregate, or a uniformly graded blend as fine aggregate. Fine aggregates must be clean, hard, durable, uncoated, and free of clay lumps, organic matter, soft or flakey material, and other foreign matter.

902.10. Surface Treatment Aggregates

- A. **Paver-Placed Surface Seal.** For paver-placed surface seal, use aggregate 27SS or 30SS consisting of material meeting the requirements in subsection 902.09.B and in accordance with Table 902-7 and Table 902-8.
- B. **Micro-Surfacing.** For micro surfacing, use 2FA and 3FA aggregates consisting of crushed material from a quarried stone, natural gravel, slag source, or a blend in accordance with Table 902-7 and Table 902-8.
- C. **Slurry Seal.** For slurry seal, use 2FA aggregate consisting of crushed material from a quarried stone, natural gravel, slag source, or a blend in accordance with Table 902-7 and Table 902-8.

902.11. Mineral Filler for HMA Mixtures

For HMA mixtures, use dry, 3MF mineral filler consisting of limestone dust, dolomite dust, fly ash collected by an electrostatic precipitation method, slag, or hydrated lime with 100% passing the No. 30 sieve and 75% to 100% passing the No. 200 sieve. Mineral filler must be from a Department-approved source or must be tested on a per-project basis. The free carbon content of the fly ash sample must not exceed 12% by weight as measured by the loss on ignition test in accordance with ASTM C311/C311M.

**Table 902-1:
Grading Requirements for Coarse Aggregates, Dense-Graded Aggregates, and Open-Graded Aggregates**

Material Type	Series/ Class	Item of Work by Section Number (Sequential)	Sieve Analysis (MTM 109) Total % Passing ^(a)										LBW (MTM 108) % Passing
			2½ inch	2 inch	1½ inch	1 inch	¾ inch	½ inch	⅜ inch	No. 4	No. 8	No. 30	No. 200 ^(a)
Coarse aggregates	6AAA ^(b)	602, 1004	—	—	100	90–100	60 – 85	30–60	—	0–8	—	—	≤1.0 ^(c)
	6AA ^(b)	406, 602, 706, 708, 806, 1004, 1006	—	—	100	95–100	—	30–60	—	0–8	—	—	≤1.0 ^(c)
	6A	206, 401, 402, 406, 602, 603, 706, 806, 1004, 1006	—	—	100	95–100	—	30–60	—	0–8	—	—	≤1.0 ^(c)
	17A	401, 406, 706, 708, 1004	—	—	—	100	90–100	50–75	—	0–8	—	—	≤1.0 ^(c)
	25A		—	—	—	—	100	95–100	60–90	5–30	0–12	—	≤3.0
	26A	706, 712, 1004, 1006	—	—	—	—	100	95–100	60–90	5–30	0–12	—	≤3.0
	29A	1004	—	—	—	—	—	100	90–100	10–30	0–10	—	≤3.0
Dense-graded aggregates	21AA	302, 304, 305, 306, 307	—	—	100	85–100	—	50–75	—	—	20–45	—	4–8 ^{(d)(e)}
	21A	302, 305, 306, 307	—	—	100	85–100	—	50–75	—	—	20–45	—	4–8 ^{(d)(e)}
	22A	302, 305, 306, 307	—	—	—	100	90–100	—	65–85	—	30–50	—	4–8 ^{(d)(e),(f)}
	23A	306, 307	—	—	—	100	—	—	60–85	—	25–60	—	9–16 ^(e)
	23AA	306, 307	—	—	—	100	—	—	60–85	—	25–60	—	9–16 ^(e)

**Table 902-1 (cont.):
Grading Requirements for Coarse Aggregates, Dense-Graded Aggregates, and Open-Graded Aggregates**

Material Type	Series/ Class		Item of Work by Section Number (Sequential)	Sieve Analysis (MTM 109) Total % Passing ^(a)										LBW (MTM 108) % Passing	
				2½ inch	2 inch	1½ inch	1 inch	¾ inch	½ inch	⅜ inch	No. 4	No. 8	No. 30	No. 200 ^(a)	
Open-graded aggregates	4G	(g)	303	—	—	100	85–100	—	45–65	—	—	15–30	6–18	≤6.0	
		(h)	303	—	—	100	85–100	—	45–70	—	—	15–35	8–22	≤8.0	
	34R		401, 404, 406	—	—	—	—	—	100	90–100	—	0–5	—	≤3.0	
	34G		404, 406	—	—	—	—	—	100	95–100	—	0–5	—	≤3.0	
	46G		206, 208, 401, 402, 406, 916	—	—	100	95–100	—	30–60	—	0–8	—	—	≤3.0	

- (a) Based on dry weights.
- (b) Class 6AAA will be used exclusively for all mainline and ramp concrete pavement when the directional commercial ADT is greater than or equal to 5,000 vehicles per day. Other requirements apply for high-performance concrete.
- (c) Loss by washing (LBW) will not exceed 2.0% for material produced entirely by crushing rock, boulders, cobbles, slag, or concrete.
- (d) When used for aggregate base courses, surface courses, shoulders, and approaches and the material is produced entirely by crushing rock, boulders, cobbles, slag, or concrete, the maximum limit for LBW must not exceed 10%.
- (e) The limits for LBW of dense-graded aggregates are significant to the nearest whole percent.
- (f) For aggregates produced from sources in Berrien County, the LBW must not exceed 8% and the sum of LBW, and shale particles must not exceed 10%.
- (g) Gradation prior to placement and compaction.
- (h) Gradation compacted in-place, sampled from the grade in accordance with MTM 119.

**Table 902-2:
Physical Requirements for Coarse Aggregates, Dense-Graded Aggregates, and Open-Graded Aggregates^(a)**

Material Type	Series/ Class	Gravel, Stone, and Crushed Concrete						Slag ^(b)		All Aggregates
		Crushed Material, % min. (MTM 117)	Loss, % max, LA Abrasion (MTM 102)	Soft Particles, % max. (MTM 110)	Chert, % max. (MTM 110)	Sum of Soft Particles and Chert, % max. (MTM 110)	Freeze- Thaw Dilation, % per 100 cycle max. (MTM 115) ^(c)	Sum of Coke and Coal Particles, % max. (MTM 110)	Freeze-Thaw Dilation, % per 100 cycles max. (MTM 115) ^(c)	Flat and Elongated Particles, ratio % max. (ASTM D4791) (MTM 130)
Coarse aggregates ^(d)	6AAA	—	40	2.0 ^(e)	2.5	4.0	0.040 ^(f)	1.0	0.040 ^(f)	3:1–15.0 ^(g)
	6AA ^(h)	—	40	2.0 ^(e)	—	4.0	0.067 ⁽ⁱ⁾	1.0	0.067	—
	6A ^(h)	—	40	3.0 ^(e)	7.0	9.0	0.067	1.0	0.067	—
	17A ^(h)	—	40	3.5 ^(e)	8.0	10.0	0.067 ⁽ⁱ⁾	1.0	0.067	—
	25A	95	45	8.0 ^(j)	—	8.0	—	1.0	—	3:1–20.0 ^(k)
	26A ^(h)	—	40	2.0 ^(e)	—	4.0	0.067	1.0	0.067	—
	29A	95	45	8.0 ^(j)	—	8.0	—	1.0	—	3:1–20.0 ^(k)
Dense-graded aggregates ^(l)	21AA	95	50	—	—	—	—	—	—	—
	21A	25	50	—	—	—	—	—	—	—
	22A	25	50	—	—	—	—	—	—	—
	23A	25	50	—	—	—	—	—	—	—
	23AA	95	50	—	—	—	—	—	—	—

**Table 902-2 (cont.):
Physical Requirements for Coarse Aggregates, Dense-Graded Aggregates, and Open-Graded Aggregates^(a)**

Material Type	Series/ Class	Gravel, Stone, and Crushed Concrete					Slag ^(b)		All Aggregates
		Crushed Material, % min. (MTM 117)	Loss, % max, LA Abrasion (MTM 102)	Soft Particles, % max. (MTM 110)	Chert, % max. (MTM 110)	Sum of Soft Particles and Chert, % max. (MTM 110)	Freeze- Thaw Dilation, % per 100 cycle max. (MTM 115) ^(c)	Sum of Coke and Coal Particles, % max. (MTM 110)	Freeze-Thaw Dilation, % per 100 cycles max. (MTM 115) ^(c)
Open-graded aggregates	4G	95	45 ^(m)			—		—	—
	34R	≤20	45 ^(m)			—		—	—
	34G	100	45 ^(m)			—		—	—
	46G	95	45 ^(m)			—		—	—

**Table 902-2 (cont.):
Physical Requirements for Coarse Aggregates, Dense-Graded Aggregates, and Open-Graded Aggregates^(a)**

- (a) See subsections 902.03.B, 902.05, and 902.06 for additional physical requirements for coarse aggregate, dense-graded aggregates, and open-graded aggregates, respectively.
 - (b) Iron blast furnace and reverberatory furnace slag must contain no free (unhydrated) lime.
 - (c) If the relative density (OD) is >0.04 less than the relative density (OD) of the most recently tested freeze-thaw sample, the aggregate will be considered to have changed characteristics and be required to have a new freeze-thaw test per MTM 113 conducted prior to use on Department projects.
 - (d) Grade 3500 concrete requires an optimized aggregate gradation as specified in section 604. Use aggregates only from geologically natural sources.
 - (e) Clay-ironstone particles must not exceed 1.0% for 6AAA, 6AA, and 26A, and 2.0% for 6A and 17A. Clay-ironstone particles are also included in the percentage of soft particles for these aggregates.
 - (f) Maximum freeze-thaw dilation is 0.067 when the directional commercial ADT is less than 5,000 vehicles per day. Maximum dilation is 0.040 for all high-performance concrete.
 - (g) ASTM D4791 Section 8.4 will be followed. The test will be performed on the material retained down to and including the 3/8-inch sieve.
 - (h) Except for pre-stressed beams, the sum of soft and chert particles may be up to 3.0% higher than the values determined from the sample tested for freeze-thaw durability. However, under no circumstances will the deleterious particle percentages exceed the specification limits in Table 902-2. In addition, a source may be restricted to a minimum percent crushed not to exceed 15% less than the percent crushed in the freeze-thaw sample. When the freeze-thaw dilation is between 0.040 and 0.067% per 100 cycles, more restrictive limits will be applied.
 - (i) Maximum dilation of 0.010 for pre-stressed concrete beams.
 - (j) Friable sandstone is included in the soft particle determination for chip seal aggregates.
 - (k) ASTM D4791 Section 8.4 will be followed. The test will be performed on the material retained down to and including the No. 4 sieve.
 - (l) Quarried carbonate (limestone or dolomite) aggregate may not contain over 10% insoluble residue finer than No. 200 sieve when tested in accordance with MTM 103.
 - (m) If a blend of different aggregate sources, the abrasion value applies to each source.
-

**Table 902-3:
Grading Requirements for Granular Materials**

Material	Sieve Analysis (MTM 109), Total % Passing ^(a)									LBW % Passing No. 200 ^{(a)(b)}
	6 inch	3 inch	2 inch	1 inch	½ inch	¾ inch	No. 4	No. 30	No. 100	
Class I	—	—	100	—	45–85	—	20–85	5–30	—	0–5
Class II ^(c)	—	100	—	60–100	—	—	50–100	—	0–30	0–7
Class IIA ^(c)	—	100	—	60–100	—	—	50–100	—	0–35	0–10
Class IIAA	—	100	—	60–100	—	—	50–100	—	0–20	0–5
Class III	100	95– 100	—	—	—	—	50–100	—	—	0–15
Class IIIA	—	—	—	—	—	100	50–100	—	0–30	0–15

(a) Test results based on dry weights.

(b) Use test method MTM 108 for LBW.

(c) Except for use in granular blankets, Class IIA granular material may be substituted for Class II granular material for projects in the following counties: Arenac, Bay, Genesee, Gladwin, Huron, Lapeer, Macomb, Midland, Monroe, Oakland, Saginaw, Sanilac, Shiawassee, St. Clair, Tuscola, and Wayne.

**Table 902-4:
Grading Requirements for Fine Aggregates**

Material	Sieve Analysis (MTM 109), Total % Passing ^(a)							LBW % Passing No. 200 ^{(a)(b)}	Fineness Modulus Variation ^(c)
	$\frac{3}{8}$ inch	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100		
2NS	100	95–100	65–95	35–75	20–55	10–30	0–10	0–3.0	$\pm 0.20^{(d)}$
2SS ^(e)	100	95–100	65–95	35–75	20–55	10–30	0–10	0–4.0	$\pm 0.20^{(d)}$
2MS	—	100	95–100	—	—	15–40	0–10	0–3.0	$\pm 0.20^{(d)}$

(a) Test results based on dry weights.

(b) Use test method MTM 108 for LBW.

(c) Aggregate having a fineness modulus differing from the base fineness modulus of the source by the amount exceeding the maximum variation specified in the table will be rejected. Use ASTM C136.

(d) The base fineness modulus will be supplied by the aggregate producer at the start of each construction season and be from 2.50 to 3.35. The base fineness modulus, including the permissible variation, will be from 2.50 to 3.35.

(e) Quarried carbonate (limestone or dolomite) cannot be used for any application subject to vehicular traffic.

**Table 902-5:
Superpave Final Aggregate Blend Gradation Requirements**

Standard Sieve	Mix Number				
	5	4	3 Leveling Course	3 Base Course	2
	% Passing Criteria (Control Points)				
1½ inch	—	—	—	—	100
1 inch	—	—	100	100	90–100
¾ inch	—	100	90–100	90–100	≤90
½ inch	100	90–100	≤90	≤90	—
⅜ inch	90–100	≤90	—	—	—
No. 4	≤90	—	—	—	—
No. 8	47–67	39–58	35–52	23–52	19–45
No. 16	—	—	—	—	—
No. 30	—	—	—	—	—
No. 50	—	—	—	—	—
No. 100	—	—	—	—	—
No. 200	2.0–10.0	2.0–10.0	2.0–8.0	2.0–8.0	1.0–7.0

**Table 902-6:
Superpave Final Aggregate Blend Physical Requirements**

Est. Traffic (million ESAL)	Mix Type	Minimum Criteria						Maximum Criteria					
		% Crushed ^(a)		Fine Aggregate Angularity		% Sand Equivalent		LA Abrasion % Loss ^(b)		% Soft Particles ^(c)		% Flat and Elongated Particles ^(d)	
		Course(s)						Course(s)					
		Top and Leveling	Base	Top and Leveling	Base	Top and Leveling	Base	Top and Leveling	Base	Top and Leveling	Base	Top and Leveling	Base
<0.3	EL	55 / —	—	—	—	40	40	45	45	10	10	—	—
≥0.3 – <3	EML	75 / —	50 / —	43	40	40	40	35	40	5	5	10	10
≥3 – <30	EMH	90 / 85	80 / 75	45	40	45	45	35	35	3	4.5	10	10
≥30 – <100	EH	100 / 100	95 / 90	45	45	50	50	35	35	3	4.5	10	10

ESAL = equivalent single-axle load

- (a) XX / YY denotes that XX% of the coarse aggregate has one fractured face and YY% has at least two fractured faces.
 (b) If a blend of different aggregate sources, the abrasion value applies to each source.
 (c) Soft particles maximum is the sum of the shale, siltstone, ochre, coal, clay-ironstone, and particles that are structurally weak or non-durable in service.
 (d) Maximum by mass with a 1:5 aspect ratio.

**Table 902-7:
Capital Preventive Maintenance Final Aggregate Blend Gradation Requirements**

Material	Mechanical Analysis, Total % Passing										
	¾ inch	½ inch	⅜ inch	¼ inch	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200 ^(a)
27SS	100	85–100	55–80	—	22–38	19–32	15–24	11–18	8–14	5–10	4–7 ^(b)
30SS	—	100	85–100	—	22–38	19–32	15–24	11–18	8–14	5–10	4–7 ^(b)
34CS ^(c)	100	100	90–100	—	0–15	0–5	—	—	—	—	≤2
CS-T ^(c)	100	100	100	85–100	—	0–15	—	—	—	—	≤2
2FA	—	—	100	—	90–100	65–90	45–70	30–50	18–30	10–21	5–15 ^(b)
3FA	—	—	100	—	70–90	45–70	28–50	19–34	12–25	7–18	5–15 ^(b)

(a) Includes mineral filler.

(b) No. 200 limits are significant to the nearest whole percent.

(c) All aggregate must be washed.

**Table 902-8:
Capital Preventive Maintenance Aggregate Blend Physical Requirements**

Material	% Crushed (Min.) MTM 117^(k)	Angularity Index (Min.) MTM 118	Uncompacted Void (Min.) AASHTO T304	LA Abrasion (% Loss Max.) MTM 102^(f)	Aggregate Wear Index (AWI) (Min.) MTM 111, 112^(h)	Soft Particles (% Max.) MTM 110	Sand Equivalent (% Min.) AASHTO T176	Flat, Elongated, or Flat and Elongated (% Max.) ASTM D4791	Absorp. (% Max.) AASHTO T85	Micro- Deval (% Loss Max.) AASHTO T327
27SS ^(e)	100 / 90	—	40	35	260	5.0 ^(a)	45	25.0 ^(b)	3.0	18
30SS ^(e)	100 / 90	—	40	35	260	5.0 ^(a)	45	25.0 ^(b)	3.0	18
34CS ^(j))	ADT ≥ 4,000	100 / 90	—	35 ^(g)	260 ⁽ⁱ⁾	3.5 ^(a)	—	15.0 ^(b)	—	—
	ADT < 4,000	95 / 85	—	35 ^(g)	220	3.5 ^(a)	—	15.0 ^(b)	—	—
CS-T ^(l)	ADT ≥ 4,000	100 / 90	—	35 ^(g)	260 ⁽ⁱ⁾	3.5 ^(a)	—	—	—	—
	ADT < 4,000	95 / 85	—	35 ^(g)	220	3.5 ^(a)	—	—	—	—
2FA	—	4.0 ^(c)	—	45	260	—	60 ^(d)	—	—	—
3FA	—	4.0	—	45	260	—	60	—	—	—

(a) Sum of shale, siltstone, clay-ironstone, and structurally weak.

(b) For material retained on the No. 4 sieve and above, ensure that the ratio between length to width, width to thickness, and length to thickness is no greater than 3:1.

(c) Angularity Index must exceed 2.0 for at least 50% of the blending sands for slurry seal applications.

(d) Does not apply to slurry seals.

(e) Must be 100% virgin aggregate.

(f) If a blend of different aggregate sources, the abrasion value applies to each source.

(g) Natural aggregate. LA abrasion maximum loss of 45% for iron blast-furnace slag aggregate.

(h) Does not apply to a shoulder chip seal or interlayer application.

(i) Single-chip seals. For double-chip seals, a 260 min. AWI of a 60/40 weighted average in which the top course will be weighted at 60% and base course will be weighted at 40% with the higher AWI aggregate as the top course.

(j) Moisture content at time of placement ≤4%.

(k) XX / YY denotes that XX% of the coarse aggregate has one fractured face and YY% has at least two fractured faces.

Section 903. Admixtures and Curing Materials for Concrete

903.01. Air-Entraining Admixtures

Select liquid air-entraining admixtures for Portland cement concrete from the Qualified Products List.

903.02. Liquid Chemical Admixtures

Select liquid chemical admixtures for use in Portland cement concrete from the Qualified Products List. Liquid chemical admixtures must not contain a chloride ion content greater than 0.5% by weight.

The Department uses the following ASTM C494/C494M terms for chemical admixtures:

**Table 903-1:
ASTM C494/C494M Terms for Chemical Admixtures**

Type	Term
A	Water-reducing admixtures
C	Accelerating admixtures
D	Water-reducing and -retarding admixtures
E	Water-reducing and -accelerating admixtures
F	Water-reducing, high-range admixtures
G	Water-reducing, high-range, and -retarding admixtures

The Department refers to water-reducing and mid-range admixtures not included in ASTM C494/C494M as Type MR.

903.03. Latex Admixtures

Formulated latex admixture for modifying mortar or concrete mixtures must be a non-toxic, film forming, polymeric emulsion to which all stabilizers are added at the point of manufacture. Latex admixtures must be homogeneous and uniform in composition.

- A. **Physical Properties.** White latex styrene butadiene modifier must have between 46.0 and 49.0% solids; pH, as shipped, between 8.5 and 11.0; and a shelf life of at least 2 years.
- B. **Storage.** Protect latex admixtures from freezing. Do not expose latex admixtures to temperatures greater than 85°F for more than 10 days.

903.04. Calcium Chloride Concrete Accelerators

Do not use calcium chloride in prestressed concrete, superstructure concrete, concrete for bridge railings, or concrete containing galvanized steel or aluminum.

Flake or pellet calcium chloride for on-the-job preparation of admixture solutions must meet the requirements of ASTM D98 for 77% grade or 94% grade. Determine the percentage of calcium and magnesium chlorides in accordance with ASTM D345. Provide flake or pellet Type S (solid) material.

Calcium chloride admixture, delivered to the job in solution, must conform to the following chemical composition:

- A. From 32.0 to 35.0% calcium chloride (CaCl_2) anhydrous;
- B. No greater than 1.0% total magnesium as MgCl_2 ;
- C. No greater than 2.0% total alkali chlorides calculated as NaCl ; and
- D. No greater than 0.5% other impurities.

903.05. Polypropylene Fibers

Use 100% virgin polypropylene fibers, $\frac{3}{4}$ inch long, that meet the requirements of ASTM C1116/C1116M, Type III.

903.06. Concrete Curing Materials for Pavements

- A. **White Membrane Curing Compound.** White membrane curing compound must meet the requirements of ASTM C309, Type 2, and be packaged in clean containers.

Before use and before transferring the compound between containers, agitate the compound to a uniform consistency and ensure that pigment is uniformly suspended.

- B. **Transparent Membrane Curing Compound for Base Course.** Transparent membrane curing compound must meet the requirements of ASTM C309, Type 1-D, Class B with fugitive dye.

903.07. Concrete Curing Materials for Structures

- A. **White Membrane Curing Compound for Bridge Decks.** Provide white-pigmented, modified, linseed-oil-based material that is either water soluble or an emulsion type that meets the requirements of ASTM C309, Type 2, except that the reflectance requirement and drying time do not apply. Compound must be packaged in clean containers.

Before transferring the compound between containers and applying, agitate the compound to a uniform consistency and ensure uniform suspension of the pigment.

- B. **Transparent Membrane Curing Compound.** Transparent membrane curing compound must meet the requirements of ASTM C309, Type 1-D, Class B, with fugitive dye.
- C. **Insulating Blankets.** Insulating blankets must have vapor-retarding liners that completely enclose the insulating mat, are bonded to both sides of the insulating mat, and have one reflective face. Blankets must have thicknesses or R-values meeting the requirements of Table 706-1.

Insulating blanket must have a thermal conductivity (k) no greater than 0.27 BTU per hour per square foot temperature gradient of 1°F per inch of thickness at a mean temperature of 75°F when tested in accordance with ASTM C177.

- D. **Polystyrene Insulation.** Expanded polystyrene must be cut from preformed material with an average cell diameter no greater than 0.04 inch and as specified in Table 903-2:

**Table 903-2:
Polystyrene Insulation Specifications**

Property	Specification	Test Method
Density	≥0.90 lb/ft ³	ASTM C303
Compressive strength	≥9.0 psi	ASTM D1621
Flexural strength	≥25.0 psi	ASTM C203
Water absorption	≤2.0% by volume	ASTM C272/C272M
Thermal conductivity	≤0.27 BTU/hr/ft ^{2(a)}	ASTM C177

(a) For a temperature gradient of 1°F per inch of thickness at a mean temperature of 75°F

Section 905. Steel Reinforcement

905.01. General Requirements

Steel reinforcement for use in concrete structures and pavements must meet the requirements of this section.

905.02. Testing

Test steel reinforcement in accordance with ASTM A370, ASTM E8/E8M, or other specified ASTM, AASHTO, or Department methods, as modified by this section.

If requested, provide the Engineer with two copies of the chemical analysis of reinforcing bars in accordance with the relevant ASTM specifications.

905.03. Bar Reinforcement for Structures

Deformed steel bars used for non-prestressed concrete reinforcement must meet the requirements of ASTM A615/A615M, ASTM A706/A706M, or ASTM A996/A996M (Type A or Type R) for Grade 60 steel bars, unless otherwise required.

Deformed steel bars used for prestressed concrete reinforcement must meet the requirements of ASTM A615/A615M, ASTM A706/A706M, or ASTM A996/A996M (Type A) for Grade 60 steel bars, unless otherwise required.

- A. **Bending.** Shop cold bend bar reinforcement to the shapes shown on the plans. Complete all field bending cold. Do not heat bars during bending.

The diameter of a bar bend, measured on the inside of the bar, must meet the requirements of Table 905-1.

**Table 905-1:
Minimum Bend Diameters**

ASTM Bar Designation No.	Minimum Inside Diameter of Bend (bar diameters)
No. 3 – No. 8	6
No. 9 – No. 11	8
No. 14, No. 18	10
Stirrups and ties, No. 3 – No. 5	4

Cut and bend bars in accordance with the *CRSI Manual of Standard Practice* and the *ACI Detailing Manual*.

- B. **Bundling and Tagging.** Ship bar reinforcement in standard bundles, tagged and marked in accordance with the *CRSI Manual of Standard Practice*.
- C. **Epoxy Coating.** Epoxy-coated steel reinforcement bars must be coated in accordance with ASTM A775/A7775M. Epoxy-coated steel-welded wire reinforcement must be coated in accordance with ASTM A884/A884M, Class A, Type 1. The following exceptions and additions apply:
 - 1. Select coating material from the Qualified Products List.
 - 2. The Department may test samples to verify thickness of coating, adhesion of coating, and holidays. Coat more steel reinforcement than shown on the plans to allow splicing to replace steel reinforcement removed for test samples.
 - 3. Include written certification from the coating applicator that the steel reinforcement was cleaned, coated, and tested in accordance with ASTM A775/A7775M (for reinforcing bars) or ASTM A884/A884M (for reinforcing wire).
 - 4. Repair damage to the coating in accordance with subsection 706.03.E.8.
- D. **Bar Chairs and Wire Ties for Epoxy-Coated Steel Reinforcement.** Bar chairs and wire ties required for placing and fastening steel reinforcement must conform to the following:
 - 1. Bar chairs must be plastic-coated wire, epoxy-coated wire, or plastic.
 - 2. Wire ties must be plastic-coated wire, epoxy-coated wire, or molded plastic clips.
 - 3. Tie-down wires must be plastic coated.

905.04. Bar Reinforcement for Pavements

Bar reinforcement for pavement tie bars and bars for use as dowels for load transfer in pavement expansion joints and contraction joints must meet the requirements of section 914.

905.05. Dowels and Bar Reinforcement for Curb, Glare Screen, Concrete Barriers, and Filler Walls

Deformed steel bars must meet the requirements of ASTM A615/A615M, ASTM A706/A706M, or ASTM A996/A996M (Type A or Type R) for Grades 40, 50, or 60 as applicable.

905.06. Steel-Welded Wire Reinforcement

Deformed steel-welded wire reinforcement must meet the requirements of ASTM A1064/A1064M and be fabricated as required.

905.07. Strand for Prestressed Concrete

Strands for prestressed concrete must have a 0.500-inch nominal diameter and a 0.153-square-inch cross sectional area or a 0.6000-inch nominal diameter and a 0.217-square-inch cross sectional area and must meet the requirements of ASTM A416/A416M for Grade 270, low relaxation strand, as required.

Identify each reel or pack number and provide a Test Data Certification, including a load elongation curve to at least 1% elongation.

Protect prestress strands from physical damage, rust, and contaminants.

905.08. Tendons for Lateral Post Tensioning of Box Beams

Tendons for lateral post tensioning of box beams must meet the requirements of ASTM A416/A416M for Grade 270 steel strand or ASTM A722/A722M for high-strength steel bars.

If selecting bars, consider the tolerances allowed in manufacturing and placing precast concrete box beams and determine the required bar lengths accordingly.

Section 909. Drainage Products

909.01. General Requirements

Use the pipe materials shown in Table 401-1 and Table 402-1 for culverts or sewers if only the size and class are specified by the contract. Construct drainage structures and underdrains as required.

Provide galvanized corrugated steel or aluminum structural plates as required. Galvanized corrugated steel structural plates must meet the requirements of AASHTO M167M/M167. Corrugated aluminum structural plates must meet the requirements of ASTM B790/B790M or Section 12 of the *AASHTO LRFD [Load and Resistance Factor Design] Bridge Specifications*.

Provide sanitary sewer or industrial waste systems in accordance with the contract. Install sanitary sewer or industrial waste systems using a compression gasket as specified in subsection 909.03.

909.02. Testing

Test drainage products in accordance with AASHTO or ASTM specifications unless otherwise specified in this section.

Verify that each concrete pipe manufacturer provides a calibrated standard testing machine to determine the strength of the product. The manufacturer must provide labor and materials to perform strength tests.

909.03. Watertight Joints for Sewers and Culverts

Provide watertight joint systems selected from the Qualified Products List. Ensure that watertight joint systems meet the pressure test requirements of MTM 723 and the specifications for the materials used in assembling the pipe system.

Use flexible rubber compression gaskets meeting the requirements of ASTM C443 for concrete pipe, ASTM F477 for plastic pipe, AASHTO M36 for corrugated metal pipe, and AASHTO M196 for corrugated aluminum pipe. As an alternative to the AASHTO M36 requirements for metal pipe, the Contractor may use gasket material meeting the low temperature flexibility and elevated temperature flow test requirements of ASTM C990, excluding the requirements for softening point, flash point, and fire point.

External rubber gaskets, mastic, and protective film must meet the requirements of ASTM C877 or C990.

909.04. Concrete Pipe Products

- A. **Reinforced Concrete Circular Pipe.** Provide reinforced concrete circular pipe meeting the requirements of AASHTO M170 or AASHTO M242. If using AASHTO M242 pipe, the design loads must meet the requirements of AASHTO M170.

If using AASHTO M170 pipe, apply the following exceptions and additions:

1. The Contractor may use the circular pipe designs specified in Table 909-1, Table 909-2, Table 909-3, and Table 909-4 in addition to the circular pipe designs in Table 2, Table 3, Table 4, and Table 5 of AASHTO M170.
2. Cast or drill lift holes and seal with concrete plugs after installing the pipe. Cast lift holes in circular pipe with elliptical reinforcing along the top centerline of the pipe.
3. Use circular reinforcement in circular pipe for use in pipe culverts and sewers jacked in place. The concrete absorption test requirements will be waived if the load required to produce the 0.01-inch crack exceeds the minimum load by at least 20%.

If using stirrup supports, use indentations or waterproof paint to mark the top and bottom centerline of the pipe, inside and out, on each end of the pipe. Symmetrically place stirrup supports around the centerline in the top and bottom portion of the pipe. Pass stirrups around and in contact with each inside circumferential reinforcing member. Space the stirrups in accordance with Table 909-2, Table 909-3, and Table 909-4. Do not use more than three sections of stirrup material in one support line. Ensure a section length of at least 30 inches for each stirrup.

- B. **Reinforced Concrete Elliptical Pipe.** Provide reinforced concrete elliptical pipe meeting the requirements of AASHTO M207. The concrete absorption test requirement will be waived if the load required to produce the 0.01-inch crack exceeds the required minimum load by at least 20%.

The Contractor may use the horizontal elliptical pipe designs specified in Table 909-5 and Table 1 of AASHTO M207.

- C. **Non-Reinforced Concrete Pipe.** Provide non-reinforced concrete pipe meeting the requirements of AASHTO M86. Place required markings on the barrel of the pipe near the socket. Ensure that the markings remain legible during delivery of the pipe to the project.
- D. **Precast Concrete Box Sections.** Use precast concrete box sections as required and in accordance with ASTM C1577.

- E. **Concrete End Sections.** Provide precast concrete end sections fabricated using material meeting the requirements of AASHTO M170 for Class II and as shown on the plans. Provide wet-cast concrete for end sections with an entrained air content of 5.5 to 8.5%. When using the dry cast process, use at least 658 pounds of cement per cubic yard of concrete and use a liquid air-entraining agent at the dosage recommended by the manufacturer for dry cast concrete.

Use tongue and groove joints to make connections to pipe culverts.

- F. **Pipe Culverts Jacked in Place.** For pipe culverts jacked in place, use reinforced concrete pipe at least 36 inches in diameter, meeting the requirements of AASHTO M170 for Class V, Wall B or C, with full circular reinforcing.
- G. **Precast Concrete Three-Sided and Arch Sections.** Use precast concrete three-sided and arch sections as required and in accordance with ASTM C1504.

909.05. Metal Pipe Products

For metal pipe products, refer to Table 909-6 for the minimum wall thickness, or refer to Table 909-7 through Table 909-17, and Table 909-20 to determine the required wall thickness.

Refer to Table 909-19 for gauge equivalents for specified nominal thicknesses.

- A. **Corrugated Steel Pipe.** Provide circular and pipe arch corrugated steel pipe meeting the requirements of AASHTO M36 for metallic-coated pipe. For polymer-precoated pipe, provide circular and pipe arch corrugated steel pipe meeting the requirements of AASHTO M245 and using an ethylene acrylic acid film selected from the Qualified Products List.

The Contractor may use Type IA and Type IIA dual-wall polymer-precoated galvanized corrugated steel pipe of the wall thicknesses specified in Table 909-20 and specified in subsection 909.05.

1. **Steel Sheet.** Provide corrugated steel pipe from zinc-coated sheets meeting the requirements of AASHTO M218 or from aluminum-coated sheets meeting the requirements of AASHTO M274.

On zinc-coated steel sheet for polymer-precoated corrugated steel pipe, use ethylene acrylic acid film selected from the Qualified Products List meeting the requirements of AASHTO M246 for Grade 250/250 polymer. Use only lock seam pipe.

Verify that the metallic coating weight on individual samples of fabricated pipe or steel sheet meets the single spot and triple spot test

requirements in accordance with AASHTO M218. Refer to Table 909-6, Table 909-7, Table 909-8, Table 909-9, Table 909-10, Table 909-11, and 909-20 for the specified nominal sheet thickness for a given diameter, class, and size of corrugation of culvert or sewer pipe.

Provide pipe less than 12 inches in diameter, fabricated from steel sheet with a minimum thickness of at least 0.064 inch (16 gauge).

2. **End Finish for Helical Corrugated Pipe.** For helical corrugated pipe, except perforated pipe, with diameters of at least 12 inches, reroll the pipe ends to form at least two circumferential corrugations in accordance with AASHTO M36 or AASHTO M245. This end treatment for perforated pipe and pipe with diameters less than 12 inches and pipe that spans the road surface in a single section is optional for the fabricator.
3. **Coupling Bands.** To connect sections of pipe and to attach end sections to culvert pipe with diameters of at least 12 inches, except perforated pipe, provide coupling bands circumferentially corrugated with the same size corrugations as on the ends of the pipe or use universal bands with gaskets.

For coupling bands with diameters no greater than 10 inches, use coupling bands with corrugations matching the pipe corrugations.

The Contractor may connect perforated pipe with a diameter no greater than 12 inches with smooth sleeve-type couplers. For perforated pipe with diameters greater than 12 inches, use coupling bands with corrugations matching the pipe corrugations, dimple bands, or universal bands.

Provide coupling band connections as specified in subsection 401.03 and meeting the requirements of AASHTO M36 or AASHTO M245.

- B. **Corrugated Aluminum Alloy Pipe.** Provide corrugated aluminum alloy pipe meeting the requirements of AASHTO M196, except fabricate pipe from aluminum sheet with the nominal thickness specified in Table 909-12, Table 909-13, Table 909-14, Table 909-15, Table 909-16, and Table 909-17.

Only use Type IA and Type IIA corrugated aluminum alloy pipe if directed by the Engineer.

- C. **Steel End Sections.** Provide steel end sections with coupling bands or hardware as shown on the plans. Metallic coating on the end sections must be the same as the metallic coating on the pipe, except zinc-coated steel end sections may be used with aluminum-coated steel pipe and

polymer-coated steel pipe. Provide metal end sections meeting the requirements of AASHTO M36.

- D. **Steel Pipe for Jacking in Place.** Provide steel pipe for jacking in place meeting the requirements of ASTM A53/A53M for Type E or Type S, Grade B, or ASTM A139/A136M for Grade B. Provide a continuous welded joint to create a watertight casing that is capable of withstanding handling and installation stresses. Perform field welding using the shielded metal arc welding process and using E6011 or E7018 electrodes.

909.06. Plastic Pipe Products

Provide smooth-lined corrugated polyethylene (CPE) pipe and required fittings meeting the requirements of AASHTO M294 for Type S.

Provide corrugated polyvinyl chloride (CPV) pipe and required fittings meeting the requirements of AASHTO M304. The Engineer will test CPV pipe in accordance with MTM 728.

If providing a separate fitting or coupling to ensure a watertight joint in corrugated plastic pipe culverts and sewers, use non-corrugated, solid sleeve, fabricated from polyethylene (PE), or polyvinyl chloride (PVC) with a gasket meeting the requirements of subsection 909.03 on both sides of the joint. Do not use split collar couplers.

Provide a pipe indentation in each sleeve in the center to ensure positioning of the pipe sections in the field. Factory-installed sleeves on one end of the pipe sections and place a removable protective material over the exposed gaskets. Lubricate gaskets and sleeves before insertion according to manufacturer's recommendations.

909.07. Pipe for Underdrains

- A. **Smooth Plastic Pipe for Underdrain.** Provide smooth plastic pipe for underdrain, fabricated from PVC pipe meeting the requirements of AASHTO M278. For pipes no greater than 6 inches in diameter, the Contractor may use acrylonitrile-butadiene-styrene (ABS) pipe meeting the requirements of ASTM D2751 for SDR 35 with perforations meeting the requirements of AASHTO M278, except that the joint tightness requirements do not apply.
- B. **Corrugated Plastic Tubing for Underdrain.** Provide corrugated plastic tubing for underdrain meeting the requirements of AASHTO M252 for PE tubing or ASTM F949 for PVC tubing. Ensure that the perforations for PE and PVC tubing meet the requirements of AASHTO M252.

- C. **Underdrain Outlets.** Provide PVC pipe underdrain outlets meeting one of the following requirements:
1. ASTM D1785 Schedule 40;
 2. ASTM D2665;
 3. ASTM D3034, for Type SDR 23.5; or
 4. Corrugated steel pipe in accordance with subsection 909.05.A.
- D. **Connections.** Seal connections with tape recommended by the manufacturer for underground service conditions. Provide tape resistant to moisture and organic growth.

909.08. Pipe for Downspouts

- A. **Bridge Deck Downspouts.** Provide bridge deck downspouts of PE pipe meeting the requirements of ASTM F714, PE 4710, DR 26, Schedule 80 PVC. The Contractor may provide bridge deck downspouts of fiberglass-reinforced thermosetting resin pipe with a short-term rupture hoops tensile stress of at least 30,000 psi in accordance with ASTM D2996. PVC pipe must be in accordance with ASTM D1785 and ASTM D4216 to prevent changes in color, physical properties, and appearance due to weathering.
- B. **Culvert, Downspouts.** If shown on the plans, provide other culvert downspouts made from one of the following:
1. Corrugated steel pipe as specified in subsection 909.05.A;
 2. Corrugated aluminum alloy pipe as specified in subsection 909.05.B;
or
 3. CPE pipe meeting the requirements of AASHTO M294 for Type C.

Provide fittings required for CPE pipe meeting the requirements of AASHTO M294.

Seal joints between lengths of pipe, as recommended by the pipe manufacturer, to form silt-tight joints. Provide end sections as shown on the plans and specified in subsection 909.04.D or subsection 909.05.C.

- C. **Bridge Deck Drain Extensions.** Provide bridge deck drain extensions as an integral component of the drain casting assembly in accordance with *MDOT Standard Plan B-101* series.

909.09. Cold-Applied Pipe Joint Sealer

Provide asphaltic material for sealing joints in concrete or clay pipe that can be spread on the joints with a trowel at an air temperature from 14 to 100°F.

The material must not flow, crack, or become brittle if exposed to the atmosphere. Verify that the material adheres to the concrete or clay to make a watertight seal.

Deliver the sealer to the project in sealed containers. Protect the sealer from contamination. Mark the container with “Cold Applied Pipe Joint Sealer” and the brand name, net volume or weight, and application requirements.

909.10. Drainage Marker Posts

Provide drainage marker posts meeting the requirements for plastic or steel delineator posts as specified in section 919 or the requirements for steel line fence posts in section 907, except provide posts at least 6 feet long. The Contractor may submit alternative post materials to the Engineer for approval.

909.11. Rodent Screens

Provide rodent screens of hardware cloth meeting the requirements of ASTM A740 with an opening size no greater than 0.30 inch, except provide wire of a nominal size of 0.057 inch and a minimum zinc coating weight of 0.59 ounce per square foot of uncoated wire surface, applied after weaving. The Contractor may substitute fabric made of Type 304 stainless steel wire with an opening no greater than 0.30 inch and a 0.057-inch nominal wire diameter. The Contractor may submit other screens with openings no greater than 0.30 inch to the Engineer for approval.

Form the screen using a punch and die. After shaping, ensure that the fabric forms a cylinder slightly larger than the inside diameter of the outlet pipe.

**Table 909-1:
Additional Designs For Class II Reinforced Concrete Pipe
(AASHTO M170 Table 2 Extended)**

Internal Diameter of Pipe (inch)	Minimum Wall Thickness (inch)	Reinforcement per Foot of Pipe Wall (sq in)			
		Circular Reinforcement in Circular Pipe		Elliptical Reinforcement in Circular Pipe	
		Inner Cage	Outer Cage	Inner Circular Cage	Elliptical Cage
114	9.5	0.56	0.34	0.22	0.34
120	10	0.61	0.37	0.24	0.37
126	10.5	0.65	0.39	0.26	0.39
132	11	0.70	0.42	0.28	0.42
144	12	0.80	0.48	0.32	0.48

Notes:
 D-load = pound-force per linear foot per foot of diameter
 D-load to produce a 0.01-inch crack: 1,000
 D-load to produce the ultimate load: 1,500
 Concrete strength: 5,000 psi

**Table 909-2:
Additional Designs for Class III Reinforced Concrete Pipe (AASHTO M170 Table 3 Extended)**

Internal Diameter of Pipe (inch)	Minimum Wall Thickness (inch)	Reinforcement per foot of Pipe Wall (sq in)				Stirrup Support System					
		Circular Reinforcement in Circular Pipe		Elliptical Reinforcement in Circular Pipe		Minimum Area per Support Element, (sq in) ^(a)	No. of Lines ^(b)	Long. Spacing (inch)	Circum. Spacing on Inner Cage (inch)	Amplitude of Supports (inch) ^(c)	Ave. Area (sq in per ft per line) ^(d)
		Inner Cage	Outer Cage	Inner Circular Cage	Elliptical Cage						
114	9½	0.69	0.41	0.28	0.41	0.041	5	2	6⅝	6.68	0.242
120	10	0.74	0.44	0.30	0.44	0.041	5	2	6½	7.16	0.242
126	10½	0.79	0.47	0.32	0.47	0.041	5	2	6⅝	7.68	0.242
132	11	0.85	0.51	0.34	0.51	0.041	5	2	7¼	8.16	0.242
144	12	0.97	0.58	0.39	0.58	0.041	5	2	8	9.16	0.242

Notes:

D-load = pound-force per linear foot per foot of diameter

D-load to produce a 0.01-inch crack: 1,350

D-load to produce the ultimate load: 2,000

Concrete strength: 5,000 psi

Where a stirrup system is shown for a given size, it must be used with the circumferential reinforcement design selected.

- (a) Two times the cross-sectional area of the wire used in the stirrup support system using 2- x 8-inch pattern for inner cage steel.
- (b) Number of longitudinal lines required in the top and in the bottom portions of the pipe.
- (c) Overall width of each line of stirrup support system using 2- x 8-inch pattern for inner cage steel. Use with Shearlock stirrups or S-stirrups or equal.
- (d) Minimum area per support times number of supports per foot using 2- x 8-inch pattern for inner cage steel.

**Table 909-3:
Additional Designs for Class IV Reinforced Concrete Pipe (AASHTO M170 Table 4 Extended)**

Internal Diameter of Pipe, (in)	Minimum Wall Thickness, (in)	Reinforcement per Foot of Pipe Wall (sq in)									
		Circular Reinforcement in Circular Pipe		Elliptical Reinforcement in Circular Pipe							
		Inner Cage	Outer Cage	Inner Circular Cage	Elliptical Cage	Stirrup Support System					
		Concrete Strength, 5,500 psi									
78	7½	0.87	0.52	0.35	0.52	0.028	11	2	4⅝	4.67	0.167
84	8	1.00	0.60	0.40	0.64						
—	—	Concrete Strength, 5,000 psi				0.028	11	2	4⅝ <th rowspan="2">5.17</th> <th rowspan="2">0.167</th>	5.17	0.167
78	7½	0.69	0.41	0.28	0.41						
84	8	0.74	0.44	0.30	0.44	0.028	11	2	4⅝	5.17	0.167
90	8	0.85	0.51	0.34	0.51	0.028	11	2	4⅝	5.17	0.167
96	8½	0.91	0.55	0.36	0.55	0.028	11	2	5⅝	5.67	0.167
102	8½	1.02	0.61	0.41	0.61	0.033	11	2	5⅝	5.67	0.195
108	9	1.07	0.64	0.43	0.64	0.043	11	2	5⅝	6.17	0.260
114	9½	1.02	0.61	0.41	0.61	0.047	11	2	6⅝	6.67	0.279
120	10	1.10	0.66	0.44	0.66	0.050	11	2	6½	7.17	0.298
126	10½	1.17	0.70	0.47	0.70	0.053	11	2	6⅝	7.67	0.316
132	11	1.25	0.75	0.50	0.75	0.056	11	2	7¼	8.17	0.335
144	12	1.42	0.85	0.57	0.85	0.064	11	2	8	9.17	0.381

Table 909-3 (cont.):
Additional Designs for Class IV Reinforced Concrete Pipe (AASHTO M170 Table 4 Extended)

Notes:

D-load = pound-force per linear foot per foot of diameter

D-load to produce a 0.01-inch crack: 2,000

D-load to produce the ultimate load: 3,000

Where a stirrup system is shown for a given size, it must be used with the circumferential reinforcement design selected.

- (a) Two times the cross-sectional area of the wire used in the S-stirrups.
- (b) Number of longitudinal lines required in the top and in the bottom portions of the pipe.
- (c) Overall width of each line of stirrup support system using 2- × 8-inch in pattern for inner cage steel. Use with Shearlock stirrups or S-stirrups or equal.
- (d) Minimum area per support times number of supports per foot using 2- × 8-inch pattern for inner cage steel.

**Table 909-4:
Additional Designs for Class V Reinforced Concrete Pipe (AASHTO M170 Table 5 Extended)**

Internal Diameter of Pipe (inch)	Wall Thickness (inch min.)	Reinforcement per Foot of Pipe Wall (sq in)				Stirrup Support System					
		Circular Reinforcement in Circular Pipe		Elliptical Reinforcement in Circular Pipe		Minimum Area per Support Element (sq in) ^(a)	Number of Lines ^(b)	Long. Spacing (inch)	Circum. Spacing on Inner Cage (inch)	Amplitude of Supports (inch) ^(c)	Ave. Area, (square inch per foot per line) ^(d)
		Inner Cage	Outer Cage	Inner Circular Cage	Elliptical Cage						
54	5½	0.64	0.38	0.26	0.38	0.028	15	2	2½	2.68	0.167
60	6	0.70	0.42	0.28	0.42	0.028	14	2	2½	3.20	0.167
66	6½	0.79	0.47	0.32	0.47	0.028	13	2	3½	3.68	0.167
72	7	0.87	0.52	0.35	0.52	0.028	12	2	3½	4.16	0.167
78	7½	0.92	0.55	0.37	0.55	0.028	11	2	4½	4.68	0.167
84	8	0.99	0.59	0.40	0.59	0.033	11	2	4½	5.16	0.195
90	8	1.13	0.68	0.45	0.68	0.040	11	2	4½	5.16	0.248
96	8½	1.20	0.72	0.48	0.72	0.043	11	2	5½	5.68	0.260
102	8½	1.34	0.80	0.54	0.80	0.051	11	2	5½	5.68	0.307
108	9	1.51	0.91	0.60	0.91	0.061	11	2	5½	6.16	0.363
114	9½	1.51	0.91	0.60	0.91	0.062	11	2	6½	6.68	0.372
120	10	1.62	0.97	0.65	0.97	0.067	11	2	6½	7.16	0.400

**Table 909-4 (cont.):
Additional Designs for Class V Reinforced Concrete Pipe (AASHTO M170 Table 5 Extended)**

Internal Diameter of Pipe (inch)	Wall Thickness (inch min.)	Reinforcement per Foot of Pipe Wall (sq in)				Stirrup Support System					
		Circular Reinforcement in Circular Pipe		Elliptical Reinforcement in Circular Pipe		Minimum Area per Support Element (sq in) ^(a)	Number of Lines ^(b)	Long. Spacing (inch)	Circum. Spacing on Inner Cage (inch)	Amplitude of Supports (inch) ^(c)	Ave. Area, (square inch per foot per line) ^(d)
		Inner Cage	Outer Cage	Inner Circular Cage	Elliptical Cage						
126	10½	1.73	1.04	0.69	1.04	0.070	11	2	6¾	7.68	0.419
132	11	1.84	1.10	0.74	1.10	0.074	11	2	7¼	8.16	0.446
144	12	2.09	1.25	0.84	1.25	0.082	11	2	8	9.16	0.493

Notes:

D-load = pound-force per linear foot per foot of diameter

D-load to produce a 0.01-inch crack: 3,000

D-load to produce the ultimate load: 3,750

Concrete strength: 6,000 psi

Where a stirrup system is shown for a given size, it must be used with the circumferential reinforcement design selected.

- (a) Two times the cross-sectional area of the wire used in the Stirrups Support System using 2 × 8-inch pattern for inner cage steel. Use with Shearlock stirrups or S-stirrups or equal.
- (b) Number of longitudinal lines required in the top and in the bottom portions of the pipe.
- (c) Overall width of each line of stirrups.
- (d) Minimum area per support times number of supports per foot using 2 × 8-inch pattern for inner cage steel.

**Table 909-5:
Additional Designs for Horizontal Elliptical Pipe**

Specified Diam., Equiv. Round Size (inch)	Specified Rise by Span (inch)	Min. Wall Thick (inch)	Reinforcement (square inch per foot)															
			Class HE-A		Class HE-I		Class HE-II		Class HE-III		Class HE-IV							
			D-Loads												Stirrup Support System			
			0.01 = 600		0.01 = 800		0.01 = 1000		0.01 = 1350		0.01 = 2000		Min. Area per Support Element (square inch)	Number of Lines ^(a)	Long. Spacing (inch)	Circum. Spacing on Inner Cage (inch) ^(b)		
			Ult = 900		Ult = 1200		Ult = 1500		Ult = 2000		Ult = 3000							
In Cage	Out Cage	In Cage	Out Cage	In Cage	Out Cage	In Cage	Out Cage	In Cage	Out Cage	In Cage	Out Cage	In Cage	Out Cage					
48	38 × 60	5½	—	—	—	—	—	—	—	—	—	0.70	0.70	0.13	15	2	3.000	
54	43 × 68	6	—	—	—	—	—	—	—	—	—	0.82	0.82	0.15	15	2	3.375	
60	48 × 76	6½	—	—	—	—	—	—	—	—	—	0.94	0.94	0.17	15	2	3.750	
66	53 × 83	7	—	—	—	—	—	—	—	—	—	0.99	0.99	0.17	15	2	4.125	
72	58 × 91	7½	—	—	—	—	—	—	—	—	—	1.11	1.11	0.19	15	2	4.500	
84	63 × 98	8	—	—	—	—	—	—	—	—	—	1.21	1.21	0.21	15	2	4.875	
78	68 × 106	8½	—	—	—	—	—	—	—	—	—	1.33	1.33	0.22	15	2	5.250	
90	72 × 113	9	0.28	0.28	0.40	0.40	0.58	0.58	—	0.84	1.43	1.43	0.24	15	2	5.625		
96	77 × 121	9½	0.30	0.30	0.45	0.45	0.65	0.65	0.92	0.92	1.56	1.56	0.26	15	2	6.000		
102	82 × 128	9¾	0.33	0.33	0.52	0.52	0.73	0.73	1.03	1.03	1.72	1.72	0.28	15	2	6.188		
108	87 × 136	10	0.36	0.36	0.60	0.60	0.83	0.83	1.16	1.16	1.92	1.92	0.30	15	2	6.375		
114	92 × 143	10½	0.40	0.40	0.64	0.64	0.88	0.88	1.23	1.23	2.02	2.02	0.32	15	2	6.750		
120	97 × 151	11	0.44	0.44	0.70	0.70	0.96	0.96	1.32	1.32	2.16	2.16	0.34	15	2	7.125		

**Table 909-5 (cont.):
Additional Designs for Horizontal Elliptical Pipe**

Specified Diam., Equiv. Round Size (inch)	Specified Rise by Span (inch)	Min. Wall Thick (inch)	Reinforcement (square inch per foot)															
			Class HE-A		Class HE-I		Class HE-II		Class HE-III		Class HE-IV							
			D-Loads												Stirrup Support System			
			0.01 = 600		0.01 = 800		0.01 = 1000		0.01 = 1350		0.01 = 2000		Min. Area per Support Element (square inch)	Number of Lines ^(a)	Long. Spacing (inch)	Circum. Spacing on Inner Cage (inch) ^(b)		
			Ult = 900		Ult = 1200		Ult = 1500		Ult = 2000		Ult = 3000							
			In Cage	Out Cage	In Cage	Out Cage	In Cage	Out Cage	In Cage	Out Cage	In Cage	Out Cage	In Cage	Out Cage	In Cage	Out Cage		
132	106 × 166	12	0.53	0.53	0.81	0.81	1.09	1.09	1.49	1.49	2.40	2.40	0.38	15	2	7.875		
144	116 × 180	13	0.61	0.61	0.91	0.91	1.21	1.21	1.64	1.64	2.62	2.62	0.42	15	2	8.625		
Concrete strength (psi)			4,000		4,000		4,000		5,000		48 inch, 54 inch, 60 inch 4,000							
														66-144 inch 5,000				

Note: Where a stirrup system is shown for a given size, it must be used with the circumferential reinforcement design selected.

- (a) Number of longitudinal lines required in the top and in the bottom portions of the pipe.
- (b) Overall width of each line of stirrups.

**Table 909-6:
References for Spiral Ribbed and Corrugated Metal Pipes**

Pipe Material Type	Driveway Culverts and Downspouts	Culverts	Sewers
	Minimum Design Life		
	25 years	50 years	70 years
Galvanized spiral ribbed metal pipe	Table 909-8	0.109 ^(a)	0.168 ^(a)
Aluminized Type 2 spiral ribbed metal pipe	Table 909-8	Table 909-11	0.138 ^(a)
Polymer-precoated spiral ribbed metal pipe	Table 909-8	Table 909-8	Table 909-8
Galvanized corrugated metal pipe	Table 909-7	Table 909-9	0.168 ^{(a),(b)}
Aluminized Type 2 corrugated metal pipe	Table 909-7	Table 909-10	0.138 ^{(a),(b)}
Polymer-precoated corrugated galvanized pipe	Table 909-7	Table 909-7	Table 909-7 ^(b)
Aluminum pipe	Table 909-12	Table 909-13	Table 909-14
Aluminum spiral ribbed pipe	Table 909-15	Table 909-16	Table 909-17
Dual-wall polymer-precoated galvanized corrugated steel pipe	Table 909-20	Table 909-20	Table 909-20

Notes:

Minimum wall thickness in inches to meet structural and durability requirements for various metal pipes to meet the design life.

Numbers represent the minimum durability gage requirements for the specific pipe material.

Table 909-7 represents the minimum structural gauge thickness requirements for corrugated steel pipe.

Table 909-8 represents the minimum structural gauge thickness requirements for spiral ribbed steel pipe.

(a) Required wall thickness (inch).

(b) Permitted for 12- to 18-inch-diameter 2 $\frac{3}{8}$ - x $\frac{1}{2}$ -inch helically corrugated pipe only.

**Table 909-7:
Wall Thickness Requirements in Inches, Based on Diameter Class of Pipe and Size of Corrugation**

Pipe Diameter (inch)	Depth of Cover							
	0–16 feet		>16–24 feet			>24–32 feet		
	Corrugation Size (inch)							
	2 $\frac{2}{3}$ × ½	3 × 1, 5 × 1	2 $\frac{2}{3}$ × ½	3 × 1	5 × 1	2 $\frac{2}{3}$ × ½	3 × 1	5 × 1
	Required Wall Thickness (inch)							
12–30	0.064	—	0.064	—	—	0.064	—	—
36–48	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064
54	0.079	0.064	0.079	0.064	0.064	0.079	0.064	0.064
60	0.109	0.064	0.109	0.064	0.064	0.109	0.064	0.064
66	0.138	0.064	0.138	0.064	0.064	0.138	0.064	0.064
72	0.138	0.064	0.138	0.064	0.064	0.138	0.064	0.064
78	0.168	0.064	0.168	0.064	0.064	0.168	0.064	0.064
84	0.168	0.064	0.168	0.064	0.064	0.168	0.064	0.079
90	—	0.064	—	0.064	0.064	—	0.079	0.079
96	—	0.079	—	0.079	0.079	—	0.079	0.079
102	—	0.079	—	0.079	0.079	—	0.079	0.109
108–120	—	0.109	—	0.109	0.109	—	0.109	0.109
126	—	0.138	—	0.138	0.138	—	0.138	0.138
130–136	—	0.138	—	0.138	0.138	—	0.138	0.138
144	—	0.168	—	0.168	0.168	—	0.168	0.168

**Table 909-8:
Wall Thickness Requirements in Inches Based on Diameter, Class of Pipe, and Size of Ribs**

Pipe Diameter (inch)	Depth of Cover					
	0–16 feet		>16–24 feet		>24–32 feet	
	Corrugation Size (inch)					
	$\frac{3}{4} \times \frac{3}{4} \times 7\frac{1}{2}$	$\frac{3}{4} \times 1 \times 11\frac{1}{2}$	$\frac{3}{4} \times \frac{3}{4} \times 7\frac{1}{2}$	$\frac{3}{4} \times 1 \times 11\frac{1}{2}$	$\frac{3}{4} \times \frac{3}{4} \times 7\frac{1}{2}$	$\frac{3}{4} \times 1 \times 11\frac{1}{2}$
	Required Wall Thickness (inch)					
18–36	0.064	0.064	0.064	0.064	0.064	0.064
42	0.064	0.064	0.064	0.064	0.064	0.079
48	0.064	0.064	0.064	0.079	0.064	0.079
54	0.079	0.064	0.079	0.079	0.079	0.109
60	0.079	0.079	0.079	0.079	0.079	0.109
66	0.109	0.079	0.109	0.109	0.109	0.109
72–78	0.109	0.109	0.109	0.109	0.109	0.109
84	—	0.109	—	0.109	—	0.109

**Table 909-9:
Wall Thickness Requirements in Inches Based on Class of Pipe and Size of Corrugation**

Pipe Diameter (inch)	Class A and Class B		Class C		Class D			
	Corrugation Size (inch)							
	2 $\frac{2}{3}$ × ½	3 × 1, 5 × 1	2 $\frac{2}{3}$ × ½	3 × 1, 5 × 1	2 $\frac{2}{3}$ × ½	3 × 1	5 × 1	
	Required Wall Thickness (inch)							
12–30	0.109	—	0.109	—	0.109	—	—	
36–60	0.109	0.109	0.109	0.109	0.107	0.109	0.109	
66–72	0.138	0.109	0.138	0.109	0.138	0.109	0.109	
78–84	0.168	0.109	0.168	0.109	0.168	0.109	0.109	
90–102	—	0.109	—	0.109	—	0.109	0.109	
108–120	—	0.109	—	0.109	—	0.109	0.109	
126	—	0.138	—	0.138	—	0.138	0.138	
130–136	—	0.138	—	0.138	—	0.138	0.138	
144	—	0.168	—	0.168	—	0.168	0.168	

**Table 909-10:
Wall Thickness Requirements in Inches Based on Diameter, Class of Pipe and Size of Corrugation**

Pipe Diameter (inch)	Class A and B		Class C			Class D		
	Corrugation Size (inch)							
	2 $\frac{2}{3}$ x 1 $\frac{1}{2}$	3 x 1, 5 x 1	2 $\frac{2}{3}$ x 1 $\frac{1}{2}$	3 x 1	5 x 1	2 $\frac{2}{3}$ x 1 $\frac{1}{2}$	3 x 1	5 x 1
	Required Wall Thickness (inch)							
12–30	0.079	—	0.079	—	—	0.079	—	—
36–54	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079
60	0.109	0.079	0.109	0.079	0.079	0.109	0.079	0.079
66–72	0.138	0.079	0.138	0.079	0.079	0.138	0.079	0.079
78–84	0.168	0.079	0.168	0.079	0.079	0.168	0.079	0.079
90–96	—	0.079	—	0.079	0.079	—	0.079	0.079
102	—	0.079	—	0.079	0.079	—	0.079	0.109
108–120	—	0.109	—	0.109	0.109	—	0.109	0.109
126	—	0.138	—	0.138	0.138	—	0.138	0.138
130–136	—	0.138	—	0.138	0.138	—	0.138	0.138
144	—	0.168	—	0.168	0.168	—	0.168	0.168

**Table 909-11:
Wall Thickness Requirements in Inches Based on Diameter,
Class of Pipe, and Size of Ribs**

Pipe Diameter (inch)	Class A and B		Class C		Class D	
	Corrugation Size (inch)					
	$\frac{3}{4} \times \frac{3}{4} \times 7\frac{1}{2}$	$\frac{3}{4} \times 1 \times 11\frac{1}{2}$	$\frac{3}{4} \times \frac{3}{4} \times 7\frac{1}{2}$	$\frac{3}{4} \times 1 \times 11\frac{1}{2}$	$\frac{3}{4} \times \frac{3}{4} \times 7\frac{1}{2}$	$\frac{3}{4} \times 1 \times 11\frac{1}{2}$
	Required Wall Thickness (inch)					
18–48	0.079	0.079	0.079	0.079	0.079	0.079
54–60	0.079	0.079	0.079	0.079	0.079	0.109
66–78	0.109	0.109	0.109	0.109	0.109	0.109
84	—	0.109	—	0.109	—	0.109

**Table 909-12:
Wall Thickness Requirements in Inches, Based on Class of Pipe
and Size of Corrugation, Lock Seam Pipe Only**

Pipe Diameter (inch)	Depth of Cover					
	0–16 feet		>16–24 feet		>24–32 feet	
	Corrugation Size (inch)					
	$2\frac{2}{3} \times \frac{1}{2}$	3×1	$2\frac{2}{3} \times \frac{1}{2}$	3×1	$2\frac{2}{3} \times \frac{1}{2}$	3×1
Required Wall Thickness (inch)						
12–27	0.060	0.060	0.060	0.060	0.060	0.060
30–36	0.075	0.060	0.075	0.060	0.075	0.060
42–54	0.105	0.060	0.105	0.060	0.105	0.060
60	0.135	0.075	0.135	0.075	0.135	0.075
66–72	0.164	0.075	0.164	0.075	0.164	0.075
78	—	0.075	—	0.075	—	0.075
84–96	—	0.105	—	0.105	—	0.105
102–108	—	0.135	—	0.135	—	0.135
112–120	—	0.164	—	0.164	—	0.164

**Table 909-13:
Wall Thickness Requirements in Inches, Based on Class of Pipe
and Size of Corrugation, Lock Seam Pipe Only**

Pipe Diameter (inch)	Class A, B, C, D Corrugation Size (inch)	
	2 2/3 × 1/2	3 × 1
	Required Wall Thickness (inch)	
12–36	0.075	0.075
42–54	0.105	0.075
60	0.135	0.075
66–72	0.164	0.075
78	—	0.075
84–96	—	0.105
102–108	—	0.135
112–120	—	0.164

**Table 909-14:
Wall Thickness Requirements in Inches, Based on Class of Pipe
and Size of Corrugation, Lock Seam Pipe Only**

Pipe Diameter (inch)	Class A, B, C, D Corrugation Size (inch)	
	2 2/3 × 1/2	3 × 1
	Required Wall Thickness (inch)	
12–54	0.105	0.105
60	0.135	0.105
66–72	0.164	0.105
78–96	—	0.105
102–108	—	0.135
112–120	—	0.164

**Table 909-15:
Wall Thickness Requirements in Inches, Based on Diameter,
Class of Pipe, and Size of Rib, Lock Seam Pipe Only**

Pipe Diameter (inch)	Class F, 3/4 × 3/4 × 7 1/2
	Required Wall Thickness (inch)
18–24	0.060
30–36	0.075
42–54	0.105
60–66	0.135

**Table 909-16:
Wall Thickness Requirements in inches, Based on Diameter,
Class of Pipe, and Size of Rib, Lock Seam Pipe Only**

Pipe Diameter (inch)	Class A, B, C, D $\frac{3}{4} \times \frac{3}{4} \times 7\frac{1}{2}$
	Required Wall Thickness (inch)
18–36	0.075
42–54	0.105
60–66	0.135

**Table 909-17:
Wall Thickness Requirements in Inches, Based on Diameter,
Class of Pipe, and Size of Rib, Lock Seam Pipe Only**

Pipe Diameter (inch)	Class A, B, C, D $\frac{3}{4} \times \frac{3}{4} \times 7\frac{1}{2}$
	Required Wall Thickness (inch)
18–54	0.105
60–66	0.135

**Table 909-18:
Jacked-in-Place Steel Pipe Nominal OD and Wall Thickness**

Nominal Size (inch)	Nominal Outside Diameter (inch)	Wall Thickness (inch)
2	2.375	0.154
4	4.500	0.188
6	6.625	0.188
8	8.625	0.188
10	10.750	0.188
12	12.750	0.188
14	14.000	0.250
16	16.000	0.250
18	18.000	0.250
20	20.000	0.250
24	24.000	0.250
30	30.000	0.312
36	36.000	0.312
42	42.000	0.438
48	48.000	0.500
54	54.000	0.563

**Table 909-19:
Gage Equivalents to Nominal Thickness**

Sheet Gauge Number	Nominal Thickness	
	Galvanized	Aluminum Alloy
18	0.052	0.048
16	0.064	0.060
14	0.079	0.075
12	0.109	0.105
10	0.138	0.135
8	0.168	0.164
7	0.188	—
5	0.218	—
3	0.249	—
1	0.280	—

**Table 909-20:
Dual Wall Polymer-Precoated Galvanized Corrugated Steel Pipe Wall Thickness Requirements in inches Based on Diameter and Size of Corrugation**

Diameter of Pipe (inch)	Corrugation Size (inch)			
	2 ² / ₃ × 1 ¹ / ₂		3 × 1	
	Shell	Liner	Shell	Liner
	Required Wall Thickness (inch)			
36–48	0.064	0.052	0.064	0.052
54	0.079	0.052	0.064	0.052
60	0.109	0.052	0.064	0.052
66–72	0.138	0.052	0.064	0.052
78–84	0.168	0.052	0.064	0.052
90–102	—	—	0.079	0.052
108–120	—	—	0.109	0.052
126–136	—	—	0.138	0.052
144	—	—	0.168	0.052

**Table 909-21:
Corrugated Steel Pipe (CSP) AASHTO LRFD Cover Heights
for CSP Pipe-Arch 3 x 1 inch**

Span x Rise (inch)	Equip Diam. (inch)	Min. Nominal Thickness (inch)^(a)	Min. Cover (feet)	Max. Cover (feet)
53 x 41	48	0.079	2.0	11
60 x 46	54	0.079	2.0	20
66 x 51	60	0.079	1.2	20
73 x 55	66	0.079	1.2	20
81 x 59	72	0.079	1.5	16
87 x 63	78	0.079	1.5	16
95 x 67	84	0.079	1.5	16
103 x 71	90	0.079	1.5	16
112 x 75	96	0.109	1.5	16
117 x 79	102	0.109	1.5	16
128 x 83	108	0.138	1.5	16
137 x 87	114	0.138	1.6	16
142 x 91	120	0.138	1.6	16

(a) Manufacturing limitations include a 0.079-inch minimum nominal thickness for 3- x 1-inch pipe-arch.

**Table 909-22:
Corrugated Steel Pipe (CSP) AASHTO LRFD Cover Heights
for CSP Pipe-Arch, 5 x 1 inch**

Span x Rise (inch)	Equip Diam. (inch)	Min. Nominal Thickness (inch)^(a)	Min. Cover (feet)	Max. Cover (feet)
53 x 41	48	0.109	2.0	11
60 x 46	54	0.109	1.2	20
66 x 51	60	0.109	1.2	20
73 x 55	66	0.109	1.2	20
81 x 59	72	0.109	1.5	16
87 x 63	78	0.109	1.5	16
95 x 67	84	0.109	1.5	16
103 x 71	90	0.109	1.5	16
112 x 75	96	0.109	1.5	16
117 x 79	102	0.109	1.5	16
128 x 83	108	0.138	1.5	16
137 x 87	114	0.138	1.6	16
142 x 91	120	0.138	1.6	16

(a) Manufacturing limitations include a 0.109-inch minimum nominal thickness for 5- x 1-inch pipe-arch.

**Table 909-23:
Corrugated Steel Pipe (CSP) AASHTO LRFD Cover Heights
for CSP Pipe-Arch 2 $\frac{2}{3}$ inch x $\frac{1}{2}$ inch**

Span x Rise (inch)	Equiv Diam. (inch)	Min. Nominal Thickness (inch)	Min. Cover (feet)	Max. Cover (feet)
17 x 13	15	0.064	1.9	12
21 x 15	18	0.064	2.0	12
24 x 18	21	0.064	1.9	12
28 x 20	24	0.064	2.0	12
35 x 24	30	0.064	2.0	12
42 x 29	36	0.064	2.0	12
49 x 33	42	0.079	2.0	12
57 x 38	48	0.109	2.0	11
64 x 43	54	0.109	2.0	11
71 x 47	60	0.138	2.0	11
77 x 52	66	0.168	2.0	12
83 x 57	72	0.168	2.0	12

**Table 909-24:
Corrugated Steel Pipe (CSP) AASHTO LRFD Cover Heights for
CSP Pipe-Arch $\frac{3}{4}$ inch x $\frac{3}{4}$ inch x 7 $\frac{1}{2}$ inch Spiral Rib Pipe**

Span x Rise (inch) ^(a)	Equiv Diam. (inch)	Min. Nominal Thickness (inch)	Min. Cover (feet)	Max. Cover (feet)
20 x 16	18	0.064	1.6	15
23 x 19	21	0.064	1.7	14
27 x 21	24	0.064	1.8	13
33 x 26	30	0.064	1.8	13
40 x 31	36	0.064	1.9	13
46 x 36	42	0.064	1.8	13
53 x 41	48	0.064 ^(b)	1.9	13
60 x 46	54	0.079	1.3	20
66 x 51	60	0.079 ^(b)	1.3	20
73 x 55	66	0.109	1.3	20
81 x 59	72	0.109 ^(b)	1.5	16
87 x 63	78	0.138	1.5	16
95 x 67	84	0.138	1.5	16
103 x 71	90	0.138 ^(b)	1.5	16

(a) ASTM A760 makes provisions for two additional sizes: 112 x 75 inch and 117 x 79 inch.

(b) Trench installation only. Embankment installations may be used for the heavier gauges.

Section 910. Geosynthetics

910.01. General Requirements

Geosynthetics must be composed of long chain synthetic fiber of at least 85% (by weight) polyolefins or polyesters. Geosynthetics must be capable of resisting degradation from chemicals, mildew, rot, and ultraviolet (UV) light.

Deliver and store geosynthetics in packaging capable of resisting UV radiation, contaminants, and moisture. Label each unit of material with product information including supplier and lot identification. Do not expose geosynthetics to direct sunlight for prolonged periods. Repair or replace damaged geosynthetics at no additional cost to the Department.

910.02. Testing

Geosynthetic testing will be in accordance with the specified ASTM or Department methods, as modified by this section.

Geosynthetics must meet the physical property requirements shown in Tables 910-1 and 910-2. The directional property values listed in Table 910-1 specify values for the weaker principal direction.

910.03. Geotextiles

Geotextiles are flexible, permeable fabrics, consisting of synthetic fibers or yarns oriented into a dimensionally stable network. Woven geotextiles must have sealed or selvaged edges to prevent raveling.

- A. **Geotextile Blanket.** Geotextile for filtration applications, including trench lining, ditch lining, streambed protection, pipe wrap, joint wrap, drainhole and weephole filter, granular blanket separation, and filter bags must be non-woven and meet the requirements shown in Table 910-1 for geotextile blanket.
- B. **Geotextile Liner.** Geotextile for erosion control in riprap and similar applications must be non-woven and meet the requirements shown in Table 910-1 for geotextile liner. Geotextile for use with heavy riprap must be non-woven and meet the requirements shown in Table 910-1 for heavy geotextile liner.
- C. **Geotextile Separator.** Geotextile used to prevent intermixing of dissimilar aggregate or soil layers must meet the requirements shown in Table 910-1 for geotextile separator. Geotextiles separators with grab tensile elongation-at-break less than 50% must meet the requirements shown in Table 910-1 for woven geotextile separator. Geotextiles with grab tensile elongation-at-break equal to or greater than 50% must meet the strength requirements shown in Table 910-1 for non-woven geotextile separator.

- D. **Stabilization Geotextile.** Geotextile used to prevent intermixing of soft subgrade and subbase materials must meet the requirements shown in Table 910-1 for stabilization geotextile.

Stabilization geotextile with grab tensile elongation-at-break less than 50% must meet the requirements shown in Table 910-1 for woven stabilization geotextile. Geotextiles with grab tensile elongation-at-break equal to or greater than 50% must meet the strength requirements shown in Table 910-1 for non-woven stabilization geotextile.

910.04. Silt Fence Geotextile

Select geotextile for fabricating silt fence from the Qualified Products List. Geotextile for silt fence must have a nominal height of 3 feet and must meet the requirements shown in Table 910-1 for silt fence. Geotextile for silt fence must have a retained strength of at least 70% after 500 hours of UV exposure when tested in accordance with ASTM D4355/D4355M. Fabricate silt fence according to subsection 916.02.

910.05. Drainage Geocomposites

Drainage geocomposites must meet the requirements shown in Table 910-1 and this subsection.

Prefabricated geocomposites for drainage applications must consist of a geotextile bonded to or wrapped around a polymer core having corrugated, dimpled, tubular, or net (mesh) configurations. Geocomposites must have sufficient flexibility and durability to withstand installation, handling, and permanent loading stresses.

Fittings for geocomposite installations must be manufactured by the geocomposite manufacturer or meet the published specifications of the geocomposite manufacturer. Provide tape used to seal connections with adhesive resistant to moisture and organic growth and recommended by the manufacturer for underground service conditions.

Obtain the Engineer's approval for all components of the geocomposite system before installation.

- A. **Wall Drain.** Wall drains for single-direction cross-planar flow must consist of an impermeable polymer core with geotextile bonded to one side. The geocomposite must have a minimum crush strength of 4,000 pounds per square foot at no more than 18% deformation when tested according to MTM 411.
- B. **Geocomposite Net.** The Engineer may allow geocomposite net consisting of geotextile blanket bonded to both sides of a mesh core as an alternative to open-graded aggregate drainage layers.

The Engineer will approve the geocomposite net based on durability, drainage capacity, crush resistance, tensile strength, and thickness.

910.06. Road Grade Biaxial Geogrid

The geogrid must be a regular grid structure and must have aperture geometry and rib and junction cross-section sufficient to permit significant mechanical interlock with the material being reinforced. The geogrid must have significant dimensional stability through all ribs and junctions of the grid structure. The geogrid must maintain its reinforcement and interlock capabilities under repeated dynamic loads while in service. The geogrid must also be resistant to UV degradation, to damage under normal construction practices, and to all forms of biological or chemical degradation normally encountered in highway construction.

The geogrid must be composed of polypropylene, HDPE, or polyester virgin resins. The protective coatings of polyester geogrids must contain less than 5% filler content. Repair damaged coating prior to backfilling. The geogrid must meet the physical property requirements of Table 910-2.

**Table 910-1:
Physical Requirements for Geotextiles**

Geotextile Category	Property				
	Grab Tensile Strength (min.) (lb)	Trapezoid Tear Strength (min.) (lb)	Puncture Strength (min.) (lb)	Permittivity (min.) (per second)	Apparent Opening Size (max.) (mm)
	Test Method				
	ASTM D4632/ D4632M	ASTM D4533/ D4533M	ASTM D6241	ASTM D4491/ D4491M	ASTM D4751
Geotextile blanket ^(a)	120	45	230	0.5	0.21
Geotextile liner	200	75	440	0.5	0.21
Heavy geotextile liner	270	100	620	0.5	0.21
Woven geotextile separator	270	100	620	0.05	0.425
Non-woven geotextile separator	200	75	440	0.5	0.425
Woven stabilization geotextile	270	100	620	0.05	0.50
Non-woven stabilization geotextile	270	100	620	0.5	0.50
Silt fence	100 ^(b)	45	—	0.1	0.60
Drainage geocomposites	200	75	440	0.5	0.21

(a) For pipe wrap where backfill around the pipe meets granular material Class IIAA requirements; geotextiles, including knitted polyester sock, which meet the following minimum requirements in the applied condition, are permitted: mass/unit area: 3.0 oz/yd²; Mullen burst strength: 100 psi; maximum apparent opening size must be 0.30 mm for pavement and foundation underdrains and 0.60 mm in other areas. The fluid displacement rate for the Mullen burst test equipment must be 170 mL/min ± 5 mL/min. Subtract tare strength from the ultimate burst strength as specified in ASTM D3786/D3786M.

(b) Elongation at the specified grab tensile strength no greater than 40% for silt fence.

**Table 910-2:
Physical Requirements for Road Grade Biaxial Geogrid**

Property	Minimum Value (except where noted below)	Test Method
Interlock open area	60%	U.S. Army Corps of Engineers ^(a)
Ultimate strength		ASTM D6637/D6637M ^(b)
MD ^(c)	1200 lb/ft	
CMD ^(c)	1950 lb/ft	
Individual junction strength		ASTM D7737/D7737M
MD ^(c)	130 lb	
CMD ^(c)	170 lb	
Tensile modulus (2%)		ASTM D6637/D6637M ^(b)
MD ^(c)	18,000 lb/ft	
CMD ^(c)	30,000 lb/ft	
Aperture size		Measured
MD ^(c)	1.0 inch (nominal value)	
CMD ^(c)	1.3 inch (nominal value)	

(a) Percent open area measured without magnification by means of U.S. Army Corps of Engineers method as specified in CW 02215, Civil Works Construction Guide Specification for Plastic Filter Fabric (1977).

(b) Ultimate strength and tensile modulus at 2% elongation measured by means of ASTM D6637/D6637M. No offset allowances or specimen pretensioning are made in calculating tensile modulus.

(c) MD (machine direction) and CMD (cross-machine direction) refer to the principal directions of the manufacturing process.

Section 911. Water

911.01. General Requirements

Water must be clean, clear, and free of oil, salt, acid, alkali, organic matter, chlorides, or other deleterious material.

911.02. Turf, Turf Establishment, and Landscape Plants

Provide water from a potable or non-potable water source approved by the Engineer. Use irrigation-quality water that is free of elements harmful to plant growth.

911.03. Mixing or Curing Concrete, Mortar, Grout, and Other Cementitious Products

Potable water from sources approved by the Michigan Department of Public Health or equivalent approved by the Engineer is acceptable without testing.

Surface water from sources including, but not limited to, ditches, lakes, ponds, quarries, rivers, streams, wetlands, and other similar untreated sources is prohibited for mixing or curing concrete, mortar, grout, and other cementitious products. Stationary concrete batch plants may use surface water if the facility has established at least a 5-year history of producing consistent concrete products meeting the required specifications. Stationary concrete batch plants using surface water are required to meet the non-potable water sampling and testing requirements.

Non-potable must meet the requirements of Table 911-1. Do not use non-potable water unless approved by the Engineer.

Test non-potable water prior to use, once per month (once per 6 months for stationary concrete batch plants) thereafter, and at any time the water source may be deemed out of compliance due to changing site conditions as determined by the Engineer. Water must be sampled and tested by a qualified independent testing laboratory having no association with the supply or production of materials produced by that concrete facility at the expense of the Contractor. Submit test results to the Engineer for approval prior to use and within 3 days of completion of testing. If water fails to meet the requirements of this specification, immediately suspend use of water source, bring water into compliance, and retest. Do not resume use of the water source until approved by the Engineer.

**Table 911-1:
Non-Potable Water Requirements**

Property	Test Method	Specification
Total solids	ASTM C1602	≤0.30%
Total organic content / carbon	SM 2540 E	≤0.05%
Alkalinity-acidity (pH)	ASTM D1067	5.5–8.5
Chloride (Cl-)	ASTM D512	≤0.05%
Time of setting	ASTM C1602	-1:00 hour to +1:30 hours of control
7-day compressive strength	ASTM C1602	≥90% of control

Section 913. Masonry Units

913.01. General Requirements

Clay brick, concrete brick, concrete block, salvaged paving brick, precast reinforced concrete units, and structural tile for masonry structures must meet the requirements of this section.

913.02. Testing

Testing will be in accordance with the specified ASTM or AASHTO method as modified by this section.

913.03. Brick

A. **Brick Dimensions.** Brick must meet the following nominal size limitations:

1. Depth – 2 to 2½ inches;
2. Width – 3½ to 3¾ inches; and
3. Length – 7½ to 8 inches.

Brick for a single structure must be of one nominal size and must not vary from the manufacturer's specified standard dimensions by more than $\pm\frac{1}{8}$ inch in any dimension. However, clay brick may vary in length by $\pm\frac{1}{4}$ inch, and up to 2% of the contract's clay brick quantity may exceed the dimensional tolerances.

B. **Clay Brick.** Clay brick to construct manholes, catch basins, and similar structures must meet the requirements of ASTM C32 for Grade MS.

Recessed or cored brick is acceptable.

Salvaged paving brick meeting the requirements of this section is acceptable.

C. **Concrete Brick.** Concrete brick must meet the requirements of ASTM C55 for concrete building brick.

Recessed or cored brick is acceptable.

D. **Sand-Lime Brick.** Sand-lime brick for masonry structures must meet the requirements of ASTM C73 for Grade SW and the following 5-hour boiling test water absorption requirements:

1. Average of five bricks – 18% maximum; and
2. Individual brick – 20% maximum.

913.04. Concrete Masonry Units for Structures Other than Drainage Structures

- A. **Load-Bearing Units.** Hollow, load-bearing, concrete masonry units must meet the requirements of ASTM C90, Normal Weight.
- B. **Non-Load-Bearing Units.** Hollow, non-load bearing, concrete masonry units must meet the requirements of ASTM C129, Normal Weight.

913.05. Concrete Block for Drainage Structures

Concrete blocks for manholes, catch basins, and inlets must meet the requirements of ASTM C139 except as modified by this subsection.

- A. **Shape.** Block must be solid with parallel inside and outside surfaces, curved to the required radii, and must have a groove or other Department-approved joint at the ends.
- B. **Size.** The block manufacturer will select the nominal block dimensions for length and height. Blocks must have a nominal width of 6, 8, or 12 inches, $\pm 3\%$, as shown on the plans.

Where standard plans call for 12-inch-thick drainage structure walls, the Contractor may use two 6-inch-wide blocks to meet the required width. Blocks must be designed for length so that only full or half-length blocks are required to lay the circular wall of any one course.

The shape of blocks for use in the cones or tops of manholes or other structures must allow for constructing the structure as shown on the plans with inside and outside joints not to exceed $\frac{1}{4}$ inch in thickness.

913.06. Precast Reinforced Concrete Units for Drainage Structures

Circular precast concrete units with circular reinforcement for tops, risers, and sump bases for manholes, catch basins, and inlets must meet the requirements of AASHTO M199 and the following additions and exceptions:

- A. Units must have the internal diameter shown on the plans and must accept standard covers.
- B. The joint with the vertical wall of the structure must be the same design as the joints in the circular pipe sections to allow a uniform bearing on the full wall thickness of the pipe.
- C. Construct openings for pipe inlets or outlets in the riser sections of drainage structures by blocking out the openings when casting the sections by scribing the openings in the green concrete and removing the green concrete from the openings or by drilling out the openings from cured concrete with a water-cooled diamond bit.

- D. Openings in the riser sections must be 3 inches larger than the OD of the inlet or outlet pipe. The interior spacing between openings in a riser section must be at least 12 inches.
- E. Obtain the Engineer's approval for the design of units for structure tops and for the design of sump risers with base units. Request approval for sump riser and base units used together.

913.07. Precast Concrete Bases for Drainage Structures

Precast concrete bases for drainage structures for sewers less than 48 inches in diameter must be cast with Grade 3000 or Grade 4000 concrete.

913.08. Structural Tile

- A. **Load-Bearing Units.** Structural clay load-bearing tile must meet the requirements of ASTM C34 for Grade LBX.
- B. **Non-Load-Bearing Units.** Structural clay non-load-bearing tile must meet the requirements of ASTM C56.

913.09. Precast Concrete Slope Paving Blocks

Blocks must have a compressive strength of at least 2,500 psi for an average of three units with no individual block having a compressive strength of less than 2,000 psi. The average water absorption of three units must be no greater than 10 pounds per cubic foot.

The Department will sample and test precast concrete slope paving blocks in accordance with ASTM C140/C140M with the following exceptions:

- A. Test 4 by 4 inch compression test specimens sawn from precast concrete slope paving block units. The specimens will be tested with the load applied in the direction of the thickness of the unit.
- B. Determine water absorption using half of the unit used for the compression test specimen.

Section 916. Erosion and Sedimentation Control Materials

916.01. Stone Used For Erosion and Sedimentation Control

Provide cobblestone, coarse aggregate 3×1, and riprap for erosion and sedimentation control on slopes, in ditches, and to construct erosion control devices, including check dams. Furnish natural stone that is sound, non-stratified, durable rock. Unless otherwise specified and not prohibited by permit, the Contractor may use sound pieces of broken concrete free of protruding reinforcement. Do not use crushed HMA pavement or broken brick as erosion and sedimentation control material.

- A. **Cobblestone.** Furnish cobblestone that consists of rounded or semi-rounded rock fragments with an average dimension from 3 to 10 inches.
- B. **Coarse Aggregate 3x1.** Furnish coarse aggregate 3×1 that meets the requirements of commercially graded material with particle sizes from ¾ to 3 inches.
- C. **Riprap.** Furnish riprap that is natural stone, solid precast concrete blocks of Grade 3000 concrete, or sound pieces of broken concrete. Riprap must not contain soil. Randomly score the face of the precast concrete blocks to provide plane-of-weakness joints in sections with areas from 4 to 9 square feet. Lifting lugs, cast into concrete blocks, must not project above the finished concrete surface.

The Department classifies riprap as plain or heavy, based on the horizontal cross section dimensions (“footprint” dimensions) and the in-place thickness of the individual pieces.

- 1. **Plain Riprap.** Provide natural stone and broken concrete with footprint dimensions from 8 to 16 inches and an in-place thickness of at least 16 inches. The Contractor may use smaller pieces to fill spaces for better slope protection.

Provide precast concrete block at least 6 inches thick with a surface area no greater than 15 square feet.

- 2. **Heavy Riprap.** The smallest footprint dimension for natural stone and broken concrete must be at least 16 inches. The maximum-to-minimum dimension ratio must be no greater than 3:1. The in-place thickness must be at least 36 inches.

Provide precast concrete block at least 16 inches thick with a surface area no greater than 20 square feet.

D. **Requirements for Specific Erosion and Sedimentation Control Applications**

1. **Checkdams.** Construct checkdams for ditches with grades less than 2% using cobblestone or broken concrete from 2 to 4 inches. Construct checkdams for ditches with grades 2% or greater using cobblestone or broken concrete from 3 to 10 inches.
2. **Stone Filled Bags.** Furnish coarse aggregate 6A, or open-graded aggregate 46G.
3. **Sand Filled Bags.** Furnish Class II granular material.
4. **Aggregate Cover.** Furnish dense-graded aggregate 21AA, open-graded aggregate 46G, coarse aggregate 6A, or coarse aggregate 3×1 produced natural aggregate, iron blast-furnace slag, reverberatory furnace slag, or crushed Portland cement concrete.
5. **Gravel Access Approach.** Furnish coarse aggregate 3×1, or as approved by the Engineer, that is produced from natural aggregate, iron-blast furnace slag, reverberatory furnace slag, or crushed Portland cement concrete.

916.02. **Silt Fence**

Geotextile for an erosion-control silt fence must meet the requirements of subsection 910.04.

Attach geotextile to machine-pointed, No. 2 common grade hardwood posts with at least five staples through wood lath at least $\frac{3}{8}$ inch thick and 2.0 feet long. Maximum post spacing is 6½ feet.

Furnish posts at least 36 inches long with a cross sectional area of at least 2¼ square inches and a smallest dimension of 1½ inches.

Identify the fabricator with at least two permanent markings or affixed labels on each assembled roll of silt fence.

916.03. **Temporary Plastic Sheet or Geotextile Cover**

Mend or patch torn or punctured plastic sheets or geotextile cover with additional material of the same quality.

- A. **Sheeting Material.** Furnish plastic sheeting material at least 6.0 mils thick with a UV ray inhibitor or PVC at least 10 mils thick. Use PVC material instead of plastic sheet from November 15 to April 1 or if expecting freezing conditions. Store and handle plastic sheet and PVC material in accordance with the manufacturer's recommendations. Do not expose sheeting material to heat or direct sunlight that would diminish strength or toughness.

- B. **Geotextile Cover.** Geotextile cover must meet the requirements of subsection 910.03.A for geotextile blanket.

916.04. Inlet Protection Fabric Drop

Furnish geotextile silt fence fabric meeting the requirements of subsection 916.02 or geotextile blanket meeting the requirements of subsection 910.03.A. Furnish 34R or 6A for gravel filter berm.

916.05. Inlet Protection Geotextile and Stone and Drop Inlet Sediment Trap

Furnish geotextile blanket meeting the requirements of subsection 910.03.A. Furnish 34R, 46G, or 6A.

916.06. Sand Fence and Dune Stabilization

Furnish HDPE mesh fabric with a design opening of ½ to 1 inch. Minimum sand fence height is 4 feet.

916.07. Turbidity Curtain

Deliver turbidity curtain pre-assembled that includes the geosynthetic fabric, connection and securing mechanisms, flotation devices, stakes, and ballast chain.

- A. **Geosynthetic.** Provide geosynthetic for turbidity curtain meeting the minimum physical requirements for stabilization geotextile that except permittivity must be no greater than 0.2 second⁻¹ as specified by ASTM D4491/D4491M, and the trapezoidal tear strength must be least 50 pounds in accordance with ASTM D4533/D4533M.

The Contractor may use polymer-impregnated geosynthetics instead of meeting permittivity and opening size requirements.

Hemmed pockets to accommodate flotation devices and bottom weights must be sewn or heat bonded. Panel ends must include metal grommets through a reinforced hem. Tie connections between panels with synthetic or wire rope to prevent water flow through the joint.

- B. **Flotation.** Furnish closed cell polystyrene flotation devices. Determine the required buoyancy based on site conditions. Flotation devices must ensure adequate freeboard to prevent overtopping.
- C. **Stakes.** If using stakes to maintain curtain alignment, provide hardwood or steel stakes of lengths and cross sections capable of supporting the curtain. The Contractor may use external supports with embedment depths greater than 1½ feet. Maximum stake spacing is 6½ feet.

- D. **Hardware.** Hardware, including stakes, ballast chain, connection bolts, reinforcement plates, and tension cables, must be galvanized, stainless steel, or aluminum and corrosion resistant. The mass of the ballast chain must be at least 0.7 pound per foot and be capable of maintaining the geosynthetic in a vertical position.

Section 917. Turf and Landscaping Materials

917.01. General Requirements

Nursery stock, seed, sod, mulching material, and chemical fertilizer nutrients must meet the requirements of this section. Provide documentation of inspection for plant diseases and insect infestation in accordance with state and federal laws.

917.02. Testing

The Engineer will require visual inspection or other acceptance tests of landscaping material as specified in this section or the MDOT's *Materials Quality Assurance Manual*.

917.03. Nursery Stock

Nursery stock must come from nurseries in Zone 4 or Zone 5 of the 2012 United States Department of Agriculture (USDA) Hardiness Zone Map for landscaping in Michigan's Lower Peninsula.

Nursery stock for landscaping in Michigan's Upper Peninsula must come from nurseries in Zone 3 or Zone 4.

Nurseries in Zone 6 of the Upper Great Lakes Region are allowed as follows:

- A. At or north of latitude 40 degrees North;
- B. Zone 6b includes only nurseries in counties that border the Great Lakes; and
- C. Zone 6 plants are not acceptable for use in Upper Peninsula or in Lower Peninsula counties north of US-10 except for counties bordering Lake Michigan.

Nursery stock must meet the requirements of ANSI Z 60.1.

Nursery stock must be true to the type and name specified by the American Joint Committee on Horticultural Nomenclature's *Standardized Plant Names*. Label each plant type with the size, species, and variety. Include the common and scientific names on the label. Provide first-class quality stock with well-developed branch systems and vigorous, healthy root systems. Ensure uniform and straight tree trunks. Nursery stock grown in sandy soils or any damaged, diseased, under-developed, or infected plant material will be rejected. Provide trees, ornamentals, and shrubs as noted on the plans.

Notify the Engineer a minimum of 24 hours before stock delivery. Provide an invoice showing plant sizes, species, and varieties for each shipment. Plants will not be accepted until the stock is delivered and inspected at the project.

The Engineer may examine plants at the nursery by removing soil from the root systems of balled or container grown plants or by digging in the nursery row. The Department will not pay for plants that fail the Engineer's inspection.

- A. **Deciduous Shade Trees.** Deciduous shade trees must be straight and symmetrical with a persistent, central main leader. The crown must be in proportion to the total height of the tree.

Clumps must have at least two stems originating from a common base at the groundline.
- B. **Small Trees, Ornamentals, and Shrubs.** Small trees, ornamentals, and shrubs must be well formed with a crown typical of each species or variety. Pruning, shearing, or sculpting plants to meet the sizes shown on the plans is not allowed.
- C. **Evergreen Trees.** Evergreen trees must be typical of the species and not sheared or color treated. Do not use evergreen trees grown for Christmas trees. Antitranspirant protection for evergreen trees is allowed.
- D. **Vines, Ground Cover, and Herbaceous Ornamental Plants.** Plants must be in individual containers, at least 1 year old, grown in pots long enough to ensure root growth capable of holding soil in place and retaining the container shape when removed from the pot. Vines must have at least four runners 1½ feet long. Leaf and stem structure of ground cover plants must be proportional to the root systems and typical of species or variety. Provide herbaceous plants in a healthy and vigorous growing condition.

917.04. Balling Material

Use untreated burlap as balling material. Do not use synthetic balling materials such as nylon or plastic.

917.05. Bracing and Guying Materials

- A. **Wire.** For trees less than 4 inches in diameter, provide No. 11 galvanized steel guy wire. For trees with a diameter greater than 4 inches, provide No. 9 galvanized steel guy wire. Provide new wire free of bends and kinks.
- B. **Hose.** Provide ¾-inch reinforced rubber garden hose or steam hose.
- C. **Stakes.** Provide green metal T-section posts without anchor plates for bracing trees. For shade trees, the minimum post length is 8 feet. For evergreen trees, the minimum post length is 6 feet.

Provide nominal 2- by 4-inch stock stakes 24 inches long for guying plants. Stakes must be beveled on two or four sides to provide a point on one end.

917.06. Topsoil

The Engineer will review the topsoil testing report to determine whether it meets the organic matter, pH, gradation, and nutrient levels as stated in Table 917-1. Ensure that the topsoil is contamination-free and clean at the source prior to transport to the project site. Obtain the Engineer's approval for salvaged topsoil prior to use. Topsoil must meet the following requirements:

- A. **Testing Reports.** Reports must contain at a minimum the following tests and the recommendation from the laboratory for amending the soil.
1. Mechanical gradation (particle size analysis);
 2. Sand/Silt/clay content determined by hydrometer test of soil passing the No. 200 sieve;
 3. Organic matter determined by an ash burn test or Walkley/Black test; and
 4. Chemical analysis for nitrate nitrogen, ammonium nitrogen, phosphorus, potassium, calcium, aluminum, lime requirements, and acidity (pH).

**Table 917-1:
Topsoil Requirements**

Requirement	Loam	Sandy Loam	Silty Loam	Clay Loam	Test Method
Passing ¾-inch sieve	100%	100%	100%	100%	ASTM D6913
Passing No. 4 sieve	>85%	>95%	>90%	>90%	ASTM D6913
Clay	10–30%	0–20%	0–25%	25–40%	ASTM D6913
Silt	30–50%	0–30%	50–90%	15–55%	ASTM D6913
Sand	25–65%	45–85%	0–50%	20–50%	ASTM D6913
Organic matter	3–10%	3–10%	3–10%	3–10%	ASTM D2974
pH	5.5–7.5	5.5–7.5	5.5–7.5	5.5–7.5	ASTM G51

917.07. Compost

The Engineer will review the compost test results to determine whether they meet the U.S. Composting Council's requirements. The Engineer will also visually inspect and approve the compost at the composting site for physical contaminants.

Compost must be mature, stabilized, humus like, and dark brown or black compost derived from the aerobic decomposition of yard clippings or other compostable materials as defined in the Natural Resources and Environmental Protection Act, Part 115, Solid Waste Management, MCL 324.11501 et seq., and federal laws. Compost must be certified through the US Composting Council's Seal of Testing Assurance Program and meet the following requirements:

- A. Must be capable of supporting plant growth;
- B. Must be free of objectionable odor, plastic, glass, metal, and other physical contaminants;
- C. Must not contain viable weed seeds or other plant parts capable of reproducing with the exception of airborne weed species; and
- D. Must not produce visible free water or dust during handling.

917.08. Peat Moss

Peat moss must consist of finely shredded sphagnum or fibrous peat moss of a Department-approved commercial grade, free of woody substance.

917.09. Fertilizers

Provide standard, commercial, packaged, or bulk product fertilizers in granular or liquid form. Each container of packaged fertilizer must be marked with the content analysis showing the minimum percentages of total nitrogen, available phosphoric acid, and soluble potash. If providing bulk fertilizer, provide an invoice with each shipment indicating the minimum percentages of total nitrogen, available phosphoric acid, and soluble potash.

A. Landscape Fertilizers

1. **Planting Fertilizers.** For mixing with peat moss and topsoil, provide ready-mixed granular fertilizer containing equal amounts of phosphorus and potassium by weight. Each cubic yard of prepared soil must contain chemical fertilizer to provide 1 pound of available phosphorus and 1 pound of available soluble potassium.
2. **Watering Fertilizers.** For application during watering, provide water soluble, nitrogen-enriched fertilizer containing 8.3 pounds of available nitrogen per 1,000 gallons of water.

B. Seeding and Sodding Fertilizers. Fertilizers in each class must contain a water-insoluble and water-soluble component.

1. **Class A.** Provide and apply as specified by this subsection and as indicated by soil tests:

- a. **Water-Insoluble Fertilizer.** Apply 32 pounds of water-insoluble nitrogen per acre (e.g., 128 pounds of ureaform, 115 pounds of isobutylidene diurea). Provide the water-insoluble nitrogen from ureaformaldehydes, coarse grade isobutylidene diurea, or both.
 - b. **Water-Soluble Fertilizer.** Apply 48 pounds of nitrogen, phosphorous, and potassium nutrient per acre (e.g., 253 pounds of 19-19-19, 400 pounds of 12-12-12). Provide water-soluble fertilizer containing a 1:1:1 ratio of nitrogen, phosphorous, and potassium. Ensure that the fertilizer components include urea, diammonium phosphate, and potassium chloride.
2. **Class B.** Provide and apply as specified by this subsection and as indicated by soil tests:
- a. **Water-Insoluble Fertilizer.** Apply 32 pounds of water-insoluble nitrogen per acre. Provide the water-insoluble nitrogen from ureaformaldehydes, coarse grade isobutylidene diurea, or both.
 - b. **Water-Soluble Fertilizer.** Apply nitrogen at a rate of 48 pounds of nutrient per acre and 40 pounds of potassium per acre. Ensure that fertilizer components include urea and potassium chloride.
3. **Class C.** Provide and apply as specified by this subsection and as indicated by soil tests:
- a. **Water-Insoluble Fertilizer.** Apply 32 pounds of water-insoluble nitrogen per acre. Provide water-insoluble nitrogen from ureaformaldehydes, coarse grade isobutylidene diurea, or both.
 - b. **Water-Soluble Fertilizer.** Apply nitrogen at a rate of 48 pounds of nutrient per acre. Ensure that the fertilizer components include urea.

917.10. Water

Use water that meets the requirements of section 911.

917.11. Seed

Provide the required certified seed mixture as specified in Table 917-2. Select each species of seed from the Qualified Products List. Supply seed in durable bags with a tag marked by the manufacturer and supplier of the blended mix showing the species and variety name, lot number, net weight of contents, purity, and germination.

**Table 917-2:
Seed Mixtures**

Species	Minimum Purity (%)	Germination (%)	Seed Mixture Proportions (% by weight)							TSM 6-24 months	TSM >24 months
			TDS	THV	TUF	TGM	THM	CR			
Kentucky blue grass	98	85	5	15	10	10	30	—	—	—	
Perennial ryegrass	96	85	25	30	20	20	20	—	50	50	
Hard fescue	97	85	25	—	20	30	—	—	—	—	
Creeping red fescue	97	85	45	45	40	40	50	—	—	—	
Fults salt grass	98	85	—	10	10	—	—	—	—	—	
Cereal rye	85	85	—	—	—	—	—	100	—	—	
Spring oats	85	85	—	—	—	—	—	—	50	50	

CR = cereal rye
 TDS = turf dry sandy
 TGM = turf medium to heavy soil
 THM = turf loamy to heavy
 THV = turf heavy soil
 TSM = temporary seeding (months)
 TUF = turf urban freeway

Seed must be tested in accordance with the AOSA [*Association of Official Seed Analysts*] *Rules for Testing Seeds*. The Engineer will evaluate deficiencies below the percentage required for purity and germination to determine acceptability.

917.12. Sod

Provide sod consisting of a densely rooted blend of at least two bluegrass varieties with at least 30% creeping red fescue content, free of weeds, and grown on the same or similar soil as the topsoil on the project. Obtain the Engineer's approval of the sod in the sod field before harvesting. Before cutting the sod, mow the grass to 3 to 4 inches above the ground surface.

Cut the sod from ½ to ¾ inch thick. If cutting sod into strips, cut in small uniform units of approximately 10 square feet per roll to ensure ease of handling of the sod without tearing or breaking. The sod may be cut, transported, and laid in large rolls with machinery designed for that purpose.

- A. **Pegs for Sodding.** Provide pegs of sound wood, at least 10 inches long, with a cross-sectional area of at least 0.75 square inch for pegging sod. Use longer pegs in sandy or similar soils.

917.13. Mulching Materials for Nursery Stock

- A. **Shredded Bark.** Provide shredded hardwood bark mulch consisting of tree bark stripped and shredded from saw logs with a debarking machine. Shredded hardwood bark mulch must be capable of passing through a conventional mulch blower. Do not use wood chips or recycled construction material.

917.14. Mulch for Seed

- A. **Loose Mulch.** Provide clean, undamaged, and rot-free straw in an air-dry condition for loose mulch. Loose mulch must be free of weed seeds and other deleterious material.
- B. **Turf Mulch Blankets.** Select turf mulch blankets from the Qualified Products List. Anchor according to the manufacturer's specifications. No metal stakes or staples are allowed.
 - 1. **High-Velocity Mulch Blankets.** High-velocity mulch blankets must have net covering on two sides. The net must meet the requirements of subsection 917.14.D and be capable of reinforcing the blanket to prevent damage during shipping, handling, and installation.
 - a. **High-Velocity Excelsior Mulch Blankets.** Provide high-velocity excelsior mulch blankets that meet the following requirements:

- i. Blanket must consist of a uniform layer of interlocking excelsior fibers cut from sound, green timber;
 - ii. The average roll weight for an entire shipment must be 12 ounces per square yard $\pm 10\%$;
 - iii. Blankets must be shipped in tightly compressed rolls; and
 - iv. Each roll must have the roll weight and the manufacturer's name written or stenciled on the roll wrapper or on an attached tag.
- b. **High-Velocity Straw Mulch Blankets.** Provide high-velocity straw mulch blankets that meet the following requirements:
- i. Blankets must consist of a uniform layer of clean wheat straw that is free of weeds and weed seed;
 - ii. When dry, the blankets must weigh 8 ounces per square yard $\pm 10\%$;
 - iii. The straw and net must be stitched together to create a uniform mat;
 - iv. Blankets must be shipped in tightly compressed rolls; and
 - v. Each roll must have the roll weight and the manufacturer's name written or stenciled on the roll wrapper or on an attached tag.

2. Mulch Blankets

- a. **Excelsior Mulch Blankets.** Provide excelsior mulch blankets meeting the requirements of high-velocity excelsior mulch blankets except that the blankets must weigh from 8 to 12 ounces per square yard and have netting on one side.
 - b. **Straw Mulch Blankets.** Provide straw mulch blankets meeting the requirements of high-velocity straw mulch blankets except that the blankets must have netting on one side.
- C. **Mulch Anchoring.** Select mulch anchoring material from the Qualified Products List.
1. **Latex-Base.** Provide latex-base mulch-anchoring material composed of 48% styrene, 50% butadiene, and 2% additive by weight. The mulch-anchoring material must contain from 42.0 to 46.0% solids and a pH, as shipped, from 8.5 to 10.0. Protect the emulsion from freezing and prolonged exposure to sunlight.

2. **Recycled Newsprint.** Provide recycled newsprint mulch consisting of specially prepared, biodegradable, shredded, recycled newsprint fibers. The recycled newsprint fiber must:
 - a. Have a moisture content (total weight) no greater than 12%;
 - b. Have a high-grade newsprint content of at least 96% by weight (oven-dry);
 - c. Include tackifier content from 1.5 to 3% by weight;
 - d. Have a water-holding capacity of at least 32 ounces per 3.5 ounces of fiber;
 - e. Contain a wetting agent and a defoaming agent; and
 - f. Contain a nontoxic bright green or blue dyestuff that adheres to the fiber to minimize leaching of the color after application.
3. **Wood Fiber.** Provide specially prepared, biodegradable, air-dried, virgin wood fibers manufactured from 100% whole wood chips. Do not use recycled materials. The wood fiber must:
 - a. Have a moisture content (total weight) no greater than 12%;
 - b. Have an organic wood fiber content of at least 95% by weight (oven-dry);
 - c. Include tackifier content from 3 to 5% by weight;
 - d. Have a water-holding capacity of at least 35 ounces per 3.5 ounces of fiber;
 - e. Be dyed with a green or blue biodegradable dye; and
 - f. Contain no growth- or germination-inhibiting materials.
4. **Guar Gum.** Provide guar gum tackifiers consisting of at least 95% guar gum by weight with the remaining 5% by weight consisting of dispersing and crosslinking additives.
5. **Other Tackifiers.** Provide water-soluble natural vegetable gums, guar gums blended with gelling and hardening agents, or a water-soluble blend of hydrophilic polymers, viscosifiers, sticking aids, and other gums as tackifiers.

D. Mulch Netting

1. **Netting.** Provide mulch net with a mesh size from ½ by ½ inch to 1½ by 2 inches, formulated from or treated with a chemical that promotes the breakdown of the net within the first growing season

after placement. Mulch netting must be strong enough to hold the mulch in place and still deteriorate when exposed to sunlight.

2. **Net Anchors.** Provide wood or other biodegradable net anchors at least 6 inches in length. Do not use steel wire staples or pins to anchor mulch blankets or netting.

917.15. Weed Control

Provide herbicides registered for use on highway right-of-way by the Michigan Department of Agriculture & Rural Development and the United States Environmental Protection Agency. Obtain the Engineer's approval of herbicides prior to use. Do not use restricted-use herbicides.

917.16. Growth Preventive Material

Provide cut stump herbicide composed of the ingredients and nominal concentrations as appropriate.

A. Upland Location

1. 83% paraffin oil, surface active compounds, and coupling agents with blue colorant
17% triclopyr, butoxyethyl ester
2. 82% paraffin oil, surface active compounds, and coupling agents with blue colorant
15% triclopyr, butoxyethyl ester
3% isopropylamine salt of imazapyr

B. Wetland or Aquatic Location

1. 100% triclopyr choline salt with blue colorant

Section 1004. Portland Cement Concrete Mixtures

1004.01. Description

Concrete must consist of a mixture specified by the grade of concrete of portland cement or blended portland cement; fine aggregate; intermediate aggregate, when required or permitted; coarse aggregate; water; and admixture, when required or permitted.

1004.02. Materials

Provide materials in accordance with the following:

Portland Cement	901
Slag Cement	901
Fly Ash	901
Coarse Aggregate 6A, 6AA, 6AAA, 26A, 29A, 17A	902
Intermediate Aggregate	902
Fine Aggregate 2NS, 2SS	902
Concrete Admixtures	903
Water	911

Select aggregates for the required grade of concrete in accordance with Table 1004-1.

Stone sand 2SS is not permitted in concrete exposed to vehicular traffic.

1004.03. General Requirements

A. **Mix Design and Documentation.** Design concrete mixtures meeting the requirements of Table 1004-1. Provide the grade of concrete for the section number reference application specified in Table 1004-1 or as specified in the contract. Concrete grades ending in HP signify high-performance concrete.

Variance requests must be submitted in writing and must include the mix design, JMF, and associated trial batch verification test data. Do not use a grade of concrete with a specified 28-day compressive strength different from what is designated for the application.

B. **Cementitious Materials Content.** Type III cement is not permitted.

Use combined weight of total cementitious materials when determining compliance with the water-cementitious ratio and cementitious material requirements.

All high-performance concrete requires 25 to 40% replacement of portland cement with supplementary cementitious materials (SCM). For all other grades of concrete, replacing portland cement with SCM is permitted. Unless otherwise specified in the contract, do not exceed a total of 40%

replacement by weight of portland cement with SCMs. Acceptable SCMs are listed in subsections 901.06, 901.07, and 901.08.

- C. **Optimized Aggregate.** Optimized aggregate gradation is required for high-performance concrete and concrete mixtures that are placed using a pump. Concrete mixtures for tremie and drilled shaft applications do not require optimized aggregate gradation. Prepare the optimized aggregate gradation and perform process control according to the procedure for optimized aggregate gradation in the contract.

Aggregates for mixture requiring optimized aggregate gradation must meet the physical requirements specified in subsection 902.03.C. The physical requirements for aggregates used in concrete mixtures for all other applications are according to the contract.

When high-performance concrete is specified in the contract, provide Grade 3500HP for mainline pavement, shoulder, miscellaneous pavement (including ramps), concrete pavement overlay applications, and bridge substructure applications; Grade 4500HP for bridge deck applications; and either concrete Grade 3500HP or 4500HP for bridge approach slab applications. The Engineer may approve Grade 3500HP or 4500HP for other applications.

Unless otherwise specified in the contract, concrete mixtures with optimized aggregate gradation may be used instead of standard concrete mixtures, as approved by the Engineer.

- D. **Air Content.** Air-entrained concrete is required unless otherwise specified.

The percentage of air in fresh concrete must meet the requirements of Table 1004-1. The Engineer will allow non-air-entrained concrete for use in steel piles that are not subject to freezing.

Use ASTM C231/C231M or ASTM C173/C173M to determine the air content of normal weight concrete. Use ASTM C173/C173M to determine the air content of lightweight concrete and concrete containing highly porous aggregates.

- E. **Consistency.** Determine consistency using the slump test in ASTM C143/C143M. Ensure that slump does not exceed the specifications in Table 1004-1.

- F. **Concrete Admixtures.** Unless otherwise specified in the contract, concrete admixtures must be selected from the Qualified Products List. The different types of admixtures are listed in subsection 903.02.

For night casting, a water-reducing admixture may be used instead of a water-reducing retarding admixture as long as the concrete can be placed

and finished in the sequence specified on the plans prior to initial set, the concrete is not subjected to residual vibration, and the concrete is not within the areas influenced by dead load deflections as a result of adjacent concrete placement operations. When the maximum air temperature is not forecasted to exceed 60°F for the day, the Contractor may use a water-reducing admixture or a water-reducing retarding admixture.

Ensure that concrete in concrete diaphragms contains a water-reducing admixture or a water-reducing retarding admixture.

Set accelerating admixtures are prohibited unless otherwise specified in the contract.

De-foaming (air detraining) admixtures are prohibited.

- G. **Concrete Temperature.** Use ASTM C1064/C1064M to determine concrete temperature.

1004.04. Measurement and Payment

The cost of PCC is included in unit prices for related pay items.

The Engineer's QA test results will be used to determine the pay factor and price adjustments. The Contractor's QC will not be used for pay factor and price adjustments.

Pay factor and price adjustments will be applied according to the contract.

**Table 1004-1:
Concrete Mixtures**

		Concrete Grade							M	X
		3000	3500	3500HP ^{(a),(b)}	4000	4000HP ^{(a),(b)}	4500	4500HP ^{(a),(b)}		
Compressive strength (psi)	7 day	2200	2600	2600	3000	3000	3200	3200	Commercial-grade concrete containing 517 lb/cyd. Portland cement may be replaced with an SCM.	Unless otherwise specified, Grade X concrete contains 282 lb/cyd of cement.
	28 day	3000	3500	3500	4000	4000	4500	4500		
	70%	2100	2450	2450	2800	2800	3150	3150		
Flexural strength (psi)	7 day	500	550	550	600	600	625	625		
	28 day	600	650	650	700	700	750	750		
	70%	420	455	455	490	490	525	525		
Slump (inch)		(c)-(f)	(c)-(k)	(c)-(k)	(l)-(n)	(l)-(n)	(d)-(f)	(e)-(f)		
Cementitious material content (lb/cyd)		489-517	517-611 ^(o)	470-564 ^(o)	517-611	517-611	517-658	517-658		
Class of coarse aggregate									(p)-(r)	
Maximum w/cm ratio									0.45	
Air content range									5.5-8.5%	
Section reference		402, 403, 602, 803, 804, 806, 808, 810, 813, 814, 819	401, 602, 603, 705, 706, 712, 713, 718, 801, 802, 803, 810, 819	401, 602, 603, 706, 712, 713, 718, 801, 802, 803, 810, 819	705, 922	705, 922	706, 711, 712	706, 711, 712	N/A	N/A

HP = high performance

- (a) HP mixtures require optimized gradation meeting subsection 1004.03.C.
- (b) HP mixtures require 25 to 40% replacement of portland cement with an SCM.
- (c) 0- to 3-inch slump for mixtures for pavements.
- (d) 0- to 3-inch slump without admixtures or with Type A or D admixture.
- (e) 0- to 6-inch slump after the addition of Type MR admixture.
- (f) 0- to 7-inch slump after the addition of Type F or G admixture.
- (g) 3- to 7-inch slump for tremie applications without admixture or with Type A or D admixture.
- (h) 3- to 7-inch slump for tremie applications after the addition of Type MR admixture.
- (i) 3- to 8-inch slump for tremie applications after the addition of Type F or G admixture.
- (j) 6- to 8-inch slump for dry placed drilled shafts.
- (k) 7- to 9-inch slump for wet placed drilled shafts.
- (l) 3- to 5-inch slump without admixtures or with Type A or D admixture.
- (m) 3- to 6-inch slump after the addition of Type MR admixture.
- (n) 3- to 7-inch slump after the addition of Type F or G admixture.
- (o) For concrete pavement repair mixtures, use 658 lb/cyd of cement when the weather is forecast to be above 50°F or 752 lb/cyd when the weather is forecast to be 50°F or below.
- (p) Use aggregates only from geologically natural sources for pavement, shoulder, miscellaneous pavement (including ramps), concrete pavement overlay, bridge approach slab, structural concrete, drilled shaft, bridge railing, and bridge sidewalk applications.
- (q) Unless otherwise required, use Coarse Aggregate 6AA or 17A for exposed structural concrete in bridges, retaining walls, and pump stations.
- (r) The flexural and compressive strengths are not part of the specifications but are listed for informational purposes only and are the minimum strengths anticipated for the mix proportions specified for the various grades of concrete when cured under standard conditions.

Section 1005. Mortar and Grout Mixtures

1005.01. Description

This work consists of producing and furnishing mortars and grouts.

1005.02. Materials

Provide materials in accordance with the following:

Portland Cement Type I, Type IA	901
Masonry Cement Type N, Type S, Type M.....	901
Hydrated Lime Type S, Type SA	901
Fine Aggregate 2NS, 2MS	902
Air-Entraining Admixture	903
Water	911

- A. **Standard Mortars and Grouts.** Proportion cement and fine aggregates as specified in Table 1005-1 and Table 1005-2 by weight for batches of at least 1 cubic yard and by weight or volume for smaller batches. Add water to obtain a mortar or grout of the required consistency.
- B. **Non-shrinking Mortar and Grout, Type H-1 (Non-metallic).** Provide Type H-1 non-shrinking mortar and grout, selected from the Qualified Products List, for filling post-tensioning stress pockets in fascia beams of prestressed box beams, under leveling plates supporting structures, for grouting dowels, and under temporary supports.
- C. **Expansive Grout, Type E-1.** Provide Type E-1 expansive grout for filling the void around post-tensioned tendons in precast concrete box beams. Proportion the grout as follows:
1. Type I portland cement, 94 pounds;
 2. Water no greater than 5 gallons; and
 3. Expansive admixture, as recommended by the manufacturer.

Do not use sand in the grout mixture. Do not use grout containing aluminum or other components that produce hydrogen, carbon dioxide, or oxygen gas.

Ensure that grout attains a 28-day minimum compressive strength of 3,000 psi in accordance with ASTM C942, except proportion the grout as specified in this subsection.

Do not use expansive admixtures, plasticizing, or water-reducing agents that contain chloride ions in excess of 0.50% by weight, fluorides, sulfides, nitrates, thixotropic additives, or chemicals that may contribute to stress corrosion in steel.

Provide admixtures in liquid or solid form. Use a gas-evolving material, well dispersed throughout the admixture. Provide grout with an unrestrained expansion from 5 to 10%, in accordance with ASTM C940/C490M, except proportion the grout as specified in this subsection and determine expansion at 3 hours.

1005.03. Construction

The contractor may remix mortars and grouts.

Do not retemper mortars and grouts or use grout and mortar after it begins to set.

Do not place mortar and grout on materials that are below 40°F. Provide protection to maintain a temperature of 45°F or higher during the curing period.

1005.04. Measurement and Payment

The cost of producing and furnishing mortar and grout is included in the unit prices for other relevant pay items.

**Table 1005-1:
Proportioning Standard Mortars and Grouts by Dry Weight**

Mortar or Grout Type	General Use	Materials				Mix Proportions by Dry Weight (lb/cyd)				
		Portland Cement	Masonry Cement	Hydrated Lime	Fine Aggregate	Portland Cement	Masonry Cement	Hydrated Lime	Fine Aggregate	Net Water
R-1 (grout)	Bond or primer coat	Type I, IA	—	—	2NS	1175	—	—	964	705
R-2 (mortar) ^(a)	Patching spalls; filling space between box beams	—	Type M	—	2MS	—	930	—	2137	415
		Type I	Type N	—	2MS	468	349	—	1991	415
		Type I, IA	—	Type S, SA	2MS	828	—	75	2016	415
		Type I, IA	—	—	2MS,2NS	930	—	—	1966	415
R-3 (mortar) ^(a)	Setting precast concrete barriers; filler between slope protection blocks and riprap	Type I, IA	—	—	2NS	765	—	—	2266	353

(a) Provide an entrained air content of 14% ±4% for mortars by using masonry cement, Type IA portland cement, Type SA lime, or an air-entraining admixture. Do not combine masonry cement and Type IA portland cement or Type IA portland cement and Type SA lime unless tests indicate that the air content is within acceptable limits.

**Table 1005-2:
Proportioning Standard Mortars and Grouts by Bulk Volume Parts**

Mortar or Grout Type	General Use	Materials				Mix Proportions by Bulk Volume Parts			
		Portland Cement	Masonry Cement	Hydrated Lime	Fine Aggregate	Portland Cement	Masonry Cement	Hydrated Lime	Fine Aggregate
R-1 (grout)	Bond or primer coat	Type I, IA	—	—	2NS	1	—	—	1
R-2 (mortar) ^(a)	Patching spalls; filling space between box beams	—	Type M	—	2MS	—	1	—	2½
		Type I	Type N	—	2MS	(b)	(b)	—	(b)
		Type I, IA	—	Type S, SA	2MS	(b)	—	(b)	(b)
		Type I, IA	—	—	2MS, 2NS	1	—	—	2½
R-3 (mortar) ^(a)	Setting precast concrete barriers; filler between slope protection blocks and riprap	Type I, IA	—	—	2NS	1	—	—	3½

- (a) Provide an entrained air content of 14% ±4% for mortars by using masonry cement, Type IA portland cement, Type SA lime, or an air-entraining admixture. Do not combine masonry cement and Type IA portland cement, or Type IA portland cement and Type SA lime, unless tests indicate that the air content is within acceptable limits.
- (b) Do not proportion by volume if blending cementitious materials (portland cement, masonry cement, or lime).