

CONTRACT DOCUMENTS

Waterfront Park Shoreline Improvements

Charter Township of Harrison
28151 L'Anse Creuse Road
Harrison Township, MI 48045

April 10, 2024

Prepared by:

Wade Trim Associates, Inc.
Detroit, MI 48226

TABLE OF CONTENTS

<u>SUBJECT</u>	<u>PAGE NO.</u>
<u>PROCUREMENT REQUIREMENTS</u>	
List of Drawing Sheets	00 0115-1
Advertisement for Bids	00 1113-1 - 2
Instructions to Bidders	00 2113-1 - 5
Supplementary Instructions to Bidders	00 2213-1 - 2
Proposal	00 4243-1 - 3
Bid Bond Form	00 4313-1
Legal Status of Bidder	00 4345-1
<u>CONTRACTING REQUIREMENTS</u>	
Notice of Award	00 5100-1 - 2
Agreement Form	00 5200-1 - 4
Notice to Proceed	00 5500-1 - 2
Performance Bond	00 6112-1 - 2
Labor and Material Payment Bond (Public Works/Nonhighway)	00 6113-3 - 4
Engineer's Certificate for Payment	00 6275-1
Application for Payment Form	00 6276-1
Payment Schedule	00 6277-1
Substitution Request Form	00 6325-1
Change Proposal Form	00 6370-1
Certificate of Substantial Completion Form	00 6516-1
Sworn Statement	00 6520-1 - 2
General Conditions	00 7200-1 - 77
Supplementary Conditions	00 7300-1 - 3
Addenda	00 9113-1

TABLE OF CONTENTS

(Continued)

<u>SUBJECT</u>		<u>PAGE NO.</u>
<u>SPECIFICATIONS</u>		
DIVISION 01 - GENERAL REQUIREMENTS		
01 1100	Summary of Work	01 1100-1 - 2
01 2200	Unit Prices	01 2200-1 - 1
01 3119	Project Meetings	01 3119-1 - 2
01 3300	Submittal Procedures	01 3300-1 - 7
01 4500	Quality Control	01 4500-1
01 5000	Temporary Facilities and Controls	01 5000-1 - 5
01 5713	Temporary Erosion and Sediment Control	01 5713-1 - 5
01 6000	Product Requirements	01 6000-1 - 2
01 7123	Construction Layout	01 7123-1 - 2
01 7700	Closeout Procedures	01 7700-1
01 8900	Site Construction Performance Requirements	01 8900-1 - 9
 DIVISION 06 – WOOD, PLASTICS and COMPOSITES		
06 1000	Rough Carpentry	06 100-1 – 8
 DIVISION 31 - EARTHWORK		
31 1100	Clearing and Grubbing	31 1100-1 - 2
31 2200	Grading	31 2200-1 - 5
31 2313	Subgrade Preparation	31 2313-1 - 8
31 2316	Structural Excavation and Backfill	31 2316-1 - 4
31 2319	Dewatering	31 2319-1 - 3
31 2333	Trenching and Backfilling	31 2333-1 - 6
31 3500	Slope Protection	31 3500-1 – 9
31 6610	Helical Piles	31 6610-1 - 9

TABLE OF CONTENTS

(Continued)

<u>SUBJECT</u>	<u>PAGE NO.</u>
<u>SPECIFICATIONS (Continued)</u>	
DIVISION 32 – EXTERIOR IMPROVEMENTS	
32 0190 Maintenance of Planted Areas	32 0190-1 - 3
32 1123 Aggregate Base Courses	32 1123-1 – 3
32 1313 Concrete Paving	32 1313-1 - 28
32 1315 Sidewalks and Driveways	32 1315-1 - 6
32 1500 Aggregate Surfacing	32 1500-1 - 5
32 3100 Fences and Gates	32 3100-1 - 7
32 9000 Planting	32 9000-1 – 10
32 9113 Imported Compost for Landscaping Areas	32 9113-1 - 2
32 9219 Seeding	32 9219-1 – 7
32 9220 Native Seeding	32 9220-1 - 10
 DIVISION 33 – UTILITIES	
33 4100 Storm Utility Drainage Piping	33 4100-1 - 8
33 4400 Storm Utility Water Drains	33 4400-1 – 5
 DIVISION 35 – WATERWAY and MARINE CONSTRUCTION	
35 6100 Turbidity Barrier	35 6100-1 - 3
 EXHIBIT I	
Geotechnical Investigation	
 EXHIBIT II	
USACE Approved Permit	

Procurement Requirements

Section 00 0115

List of Drawing Sheets

Part 1 General

1.01 Description

The Plans bearing the general title of Waterfront Park Shoreline Improvements and dated April 10, 2024, are included with and form a part of the Contract Documents for this Project.

1.02 List of Plans

<u>TITLE</u>	<u>SHEET NUMBER</u>
Cover Sheet	C-0.0
General Notes and Legend	C-0.1
Existing Conditions Plan	C-0.2
Demolition Plan	C-1.0
Demolition Details	C-1.1
Site Plan	C-2.0
Grading Plan	C-3.0
Section Views	C-3.1
Site Details	C-4.0 – 4.2
Structural Details	C-4.3 – 4.6
Soil Erosion and Sedimentation Control Plan	C-5.0
Soil Erosion and Sedimentation Control Legend and Notes	C-5.1
Soil Erosion and Sedimentation Control Standard Details	C-5.2
Landscape Plan and Details	L-1.0
Landscape Notes and Details	L-1.1

Part 2 Products (Not Used)

Part 3 Execution (Not Used)

End of Section

Advertisement for Bids

WATERFRONT PARK SHORELINE IMPROVEMENTS
CHARTER TOWNSHIP OF HARRISON, MI

Harrison Charter Township has implemented online project bidding using the Quest Construction Data Network (QuestCDN).

Only electronic bids submitted through www.questcdn.com will be accepted for this project

Sealed Bids will be received by the Charter Township of Harrison through QuestCDN until 2:00 p.m., Local Time, Thursday, May 16, 2024. Shortly after the bid closing time a bid tabulation will be prepared and posted online. Bids will be received for the following work.

Waterfront park development consisting of miscellaneous removals, grading, construction of fishing platform pier, gravel paths, sidewalks, storm sewer, stone revetment, low marsh area, coir matting, kayak launch ramp, plantings, and related work.

Contract Documents may be examined at the following locations: Charter Township of Harrison, 28151 L'Anse Creuse Road, Harrison Township, MI 48045; Construction Association of Michigan, 43636 Woodward, P.O. Box 3204, Bloomfield Hills, Michigan 48302; and Wade Trim Associates, Inc., 25251 Northline Road, Taylor, Michigan 48180. Plans and spec are also available for viewing at no cost (not to be used for bidding purposes) online at: www.wadetrim.com/resources/bid-tab/

The Contract Documents for bidding purposes are only available from QuestCDN starting on Monday, April 15, 2024. The Contract Documents can be viewed and downloaded by registering for free with QuestCDN online (www.questcdn.com) or by calling 952-233-1632. The QuestCDN **Project Number** is **9082354**. There is a Twenty-two (\$22.00) nonrefundable fee for downloading the Contract Documents in pdf format. You must download the Documents from QuestCDN to be included on the planholders list.

You must download the Contract Documents from QuestCDN to Bid on the Project, to be included on the planholders list, and to receive Addenda. Bids will be received electronically through QuestCDN as outlined in the Supplemental Instructions to Bidders. There is a Twenty (\$20.00) non-refundable fee for submitting a Bid.

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

This Project is funded in part by the Michigan Department of Natural Resources, Michigan Natural Resources Trust Fund grant. All relevant State and Federal requirements apply to this Project. These include, but are not limited to, the provisions of P.A. 453 of 1976 (Elliot-Larson Civil Rights Act) and P.A. 453 of 1976 (American Disabilities Act).

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

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

All inquiries shall be directed to Matthew D. Clark, PLA (313) 961-3650.

Mr. Adam Wit, Clerk
Charter Township of Harrison
28151 L'Anse Creuse Road
Harrison Township, MI 48045

Wade Trim Associates, Inc.
500 Griswold St, Suite 2500
Detroit, MI 48226

Instructions to Bidders

Part 1 – General

1.01 Defined Terms

Terms used in these Instructions to Bidders have the meanings assigned to them in the General Conditions. The term "Bidder" means one who submits a Bid directly to OWNER as distinct from a subbidder who submits a Bid to a Bidder. The term "Successful Bidder" means the lowest, qualified, responsible Bidder to whom OWNER makes an award. The terms "OWNER" and "ENGINEER" are defined in the Supplementary Instructions to Bidders.

1.02 Scope of Work

The scope and location of Work are set forth in Section 01 1100, Summary of Work.

1.03 Bidders Qualifications

No Bid will be considered from any Bidder unless known to be skilled and regularly engaged in work of a character similar to that covered by the Contract Documents. In order to aid the OWNER in determining the responsibility of any Bidder, the Bidder, within 48 hours after being requested in writing by the OWNER to do so, shall furnish evidence, satisfactory to the OWNER, of the Bidder's experience and familiarity with Work of the character specified, and his financial ability to properly prosecute the proposed Work to completion within the specified time. The evidence requested may include, but shall not be limited to, the following:

- A. The address and description of the Bidder's plant or permanent place of business.
- B. The Bidder's performance records for all Work awarded to, or started by him within the past three years.
- C. An itemized list of the Bidder's equipment available for use on the proposed Contract.
- D. The Bidder's financial statement, including statement of ownership of equipment necessary to be used in executing Work under Contract.

- E. Evidence that the Bidder is authorized to do business in the state in which the project is located, in case of a corporation organized under the laws of any other state; and
- F. Such additional information as will satisfy the OWNER that the Bidder is adequately prepared to fulfill the Contract.

1.04 Examination of Contract Documents and Site

- A. It is the responsibility of each Bidder before submitting a Bid, to:
 - (a) examine the Contract Documents thoroughly,
 - (b) visit the site to familiarize himself with local conditions that may in any manner affect cost, progress or performance of the Work,
 - (c) consider federal, state, and local Laws and Regulations that may affect cost, progress, performance, or furnishing of the Work; and
 - (d) study and carefully correlate Bidder's knowledge and observations with the Contract Documents and such other related data; and
 - (e) promptly notify ENGINEER in writing of all conflicts, errors, ambiguities or discrepancies which Bidder has discovered in or between Contract Documents and such related documents.
- B. Reference is made to the Supplementary Conditions for the identification of those reports of investigations and tests of subsurface and latent physical conditions at the site or otherwise affecting cost, progress or performance of the Work which have been relied upon by ENGINEER in preparing the Contract Documents.

If such reports are not included as appendices to the Contract Documents, OWNER will make copies available to any Bidder requesting them. These reports are included for reference only

and are not guaranteed as to accuracy or completeness, nor are they part of the Contract Documents.

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

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

- C. On request OWNER will provide each Bidder access to the site to conduct such investigations and tests as each Bidder deems necessary for submission of his Bid. Bidder shall fill all holes and clean up and restore the site to its former conditions upon completion of such investigations and tests.
- D. The lands upon which the Work is to be performed, rights-of-way for access thereto and other lands designated for use by CONTRACTOR in performing the Work are identified in Section 01 1100, Summary of Work, or on the Plans.
- E. The locations of utilities as shown on the Plans are taken from sources believed to be reliable. Neither the OWNER nor the ENGINEER will be responsible for any omissions of, or variations from, the indicated location of existing utilities which may be encountered in the Work.
- F. The submission of a Bid will constitute an incontrovertible representation by the Bidder that he has complied with every requirement of this Article 1.04, that without exception the Bid is based upon performing and furnishing the Work required by the Contract Documents and applying the specific means, methods,

techniques, sequences or procedures of construction (if any) that may be shown, indicated or required by the Contract Documents, that Bidder has given ENGINEER written notice of all conflicts, errors, ambiguities and discrepancies that Bidder has discovered in Contract Documents and the resolution by ENGINEER is acceptable to Bidder, and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performing and furnishing the Work, and that the time stated in the Proposal is sufficient to complete the project.

1.05 Interpretations Addenda

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

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

1.06 Bid Security

- A. Bid Security shall be made payable to OWNER, in an amount of five (5) percent of the Bidder's maximum Bid price and in a form as indicated in the Advertisement. Bid Bonds, if indicated as acceptable in the Advertisement, shall be issued on the form included in the Contract Documents by a Surety meeting the requirements of paragraph 5.01 of the General Conditions.

B. The Bid Security of the Successful Bidder will be retained until such Bidder has executed the Agreement and furnished the required Contract Security, whereupon it will be returned; if the successful Bidder fails to execute and deliver the Agreement and furnish the required Contract Security within 15 days of the Notice of Award, OWNER may annul the Notice of Award and the Bid Security of that Bidder will be forfeited. The Bid Security of any Bidder whom OWNER believes to have a reasonable chance of receiving the award may be retained by OWNER until the earliest of the seventh day after the "Effective Date of Agreement" (which term is defined in the General Conditions) or the expiration of the hold period on the Bids. Bid Security of other Bidders will be returned within 14 days of the Bid opening, unless indicated otherwise in the Advertisement.

1.07 Contract Time

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

1.08 Substitute and "Or-Equal" Items

The Contract, if awarded, will be on the basis of materials and equipment described in the Plans or specified in the Specifications without consideration of possible substitute or "or-equal" items. Whenever it is indicated in the Plans or specified in the Specifications that a substitute or an "or-equal" item of material or equipment may be furnished or used by CONTRACTOR if acceptable to ENGINEER, application for such acceptance will not be considered by ENGINEER until after the Effective Date of Agreement. In addition, in no case shall ENGINEER's denial of CONTRACTOR's application give rise to any claim for additional cost, it being understood by CONTRACTOR that acceptance of substitute or an "or equal" item of material is at the sole discretion of ENGINEER.

1.09 Receipt and Form of Bid

Bids shall be submitted at the time and place indicated in the Advertisement for Bids and shall be included in an opaque sealed envelope, marked with the Project title and name and address of the Bidder and accompanied by the Bid Security and other required documents. If the Bid is sent through the mail or other delivery system, the sealed envelope shall be enclosed in a separate envelope with the notation "BID ENCLOSED" on the face thereof. Any Bid received after the scheduled time and place indicated in the Advertisement for Bids shall be returned unopened.

A. The OWNER invites bids on the Proposal and other form(s) attached hereto. Bids will be received at the time and place indicated in the Advertisement and thereupon will be publicly opened and read. An abstract of the amounts of the base bids and any major alternates will be made available after the opening of Bids.

B. The OWNER may consider as informal any Bid on which there is an alteration of, or departure from the Proposal Form attached hereto.

C. The complete set of Contract Documents must be used in preparing Bids: neither OWNER nor ENGINEER assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Contract Documents. In order to verify the completeness of the set of Contract Documents the Bidder used in preparing his Bid, the OWNER may require the Bidder to submit the set of Contract Documents he used in preparing his Bid. The Bidder shall submit his Bid on the separate Proposal form included in these Contract Documents.

D. The Proposal shall be legibly prepared, with ink or typewriter, on the form included in these Contract Documents. All blank spaces in the proposal forms must be correctly filled in where indicated for each and every item for which a quantity is given. Proposals will be compared on basis of lump sum items, if any, and on product of the quantities of items listed at the respective unit prices bid.

- E. Erasures or other changes in the Bids must be explained or noted over the signature of the Bidder.
- F. All names must be typed or printed below the signature.
- G. The quantities as shown in the Proposal are approximate only and will be used as a basis of comparison of Bids, and award of Contracts. Payment will be made on basis of actual quantities of Work performed in accordance with the Contract Documents. The Unit Prices bid, shall include such amounts as the Bidder deems proper for overhead, profit, taxes, General Conditions and such other incidentals as noted in the Contract Documents.
- H. The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Proposal Form.
- I. The Legal Status of Bidder Form contained in the Contract Documents must be submitted with each Proposal and must clearly state the legal position of a Bidder. In the case of a corporation, the home address, name and title of all officers must be given. In the case of a partnership, show names and home addresses of all partners. If an individual, so state. Any individual bid not signed by the individual must have attached, thereto, a power of attorney evidencing authority to sign.
- J. Other documents to be attached to the Proposal and made a condition thereof are identified in the Proposal. The same individual signing the Proposal shall sign these other documents.

1.10 Modifications and Withdrawal of Bids

Bids may be modified or withdrawn by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids. If, within 24 hours after Bids are opened, any Bidder files a duly signed written notice with OWNER and promptly thereafter demonstrates to the reasonable satisfaction of OWNER that there was a material and substantial mistake in the preparation of his Bid, that Bidder may withdraw

his Bid and the Bid Security will be returned. Thereafter, at the sole option of the OWNER, that Bidder will be disqualified from further Bidding on the Work to be provided under the Contract Documents.

1.11 Award of Contract

- A. OWNER reserves the right to reject any and all Bids for any reason, to waive any and all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder, and the right to disregard all nonconforming, non-responsive, unbalanced, or conditional Bids. Discrepancies between words and figures will be resolved in favor of words. Discrepancies in the multiplication of units of work and unit prices, will be resolved in favor of unit price. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.
- B. In evaluating Bids, OWNER shall consider the qualifications of the Bidders, whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data if requested in the Bid forms. It is OWNER's intent to accept alternates (if any are accepted) in the order in which they are listed in the Bid form but OWNER may accept them in any order or combination.
- C. Subject to the approval of the OWNER, the Contract will be awarded to the lowest responsive and responsible Bidder. Responsibility of Bidder will be determined on basis of past performance and Work of similar character, equipment and labor available to do the Work and financial status. The Contract shall be considered to have been awarded after the approval of the OWNER has been duly obtained and a formal Notice of Award duly served on the successful Bidder by the OWNER. The Contract shall not be binding upon the OWNER until the Agreement has been duly executed by the Bidder and the duly authorized officials of the OWNER.

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

1.12 Signing of Agreement

Within 15 days after OWNER gives a Notice of Award to the successful Bidder, the CONTRACTOR shall sign and deliver the specified number of counterparts of the Agreement to OWNER with all other Contract Documents attached. Within ten (10) days thereafter, OWNER will deliver two (2) fully signed counterparts to CONTRACTOR. ENGINEER will identify, date or correct those portions of the Contract Documents not fully signed, dated or executed by OWNER and CONTRACTOR and such identification, dating or correction shall be binding on all parties.

Part 2 - Products (Not Used)

Part 3 - Execution (Not Used)

End of Section

Supplementary Instructions to Bidders

Part 1 General

1.01 Modifications

These Supplementary Instructions to Bidders amend or supplement the Instructions to Bidders as indicated below. All provisions which are not amended or supplemented remain in full force and effect.

The terms used in these Supplementary Instructions to Bidders have the meanings assigned to them in the Instructions to Bidders, General Conditions, and as follows:

- A. OWNER -- Harrison Charter Township, 28151 L'Anse Creuse Road, Harrison Township, MI 48045; a Municipal Corporation, and being a party of the first part of this Contract.
- B. ENGINEER -- Wade Trim Associates, Inc., 500 Griswold St, Suite 2500, Detroit, Michigan 48226, or his duly authorized representative.

SIB-1.09 Receipt and Form of Bid

Delete Article 1.09 of the Instructions to Bidders and insert the following in its place:

1.09 Receipt and Form of Bid

- A. Bids shall be submitted electronically only at the time and place indicated in the Advertisement for Bids and shall be accompanied by the Bid Security and other required documents.
- B. The OWNER invites bids on the Proposal and any other form(s) attached thereto.
- C. The complete set of Contract Documents must be used in preparing Bids; neither OWNER nor ENGINEER assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Contract Documents.
- D. The quantities as shown in the Proposal are approximate only and will be used as a basis of comparison of Bids, and award of Contract(s). Payment will be made on basis of actual quantities of Work performed in accordance with the Contract Documents. The Unit Prices bid, shall include such amounts as the Bidder deems proper for overhead, profit, taxes, General Conditions and such other incidentals as noted in the Contract Documents.
- E. The Bidder shall acknowledge receipt of all Addenda as provided for in the electronic bidding platform. Failure to acknowledge Addenda shall be cause for rejection of bid.
- F. The Legal Status of Bidder Form contained in the Contract Documents must be submitted with each Bid and must clearly state the legal position of a Bidder. In the case of a corporation, the home address, name and title of all officers must be given. In the case of a partnership, show names and home addresses of all partners. If an individual, so state. Any individual bid not signed by the individual must have attached, thereto, a power of attorney evidencing authority to sign.

- G. Other documents to be attached to the Proposal and made a condition thereof are identified in the Proposal.
- H. A tabulation of the amounts of the base bids and any alternates will be made available after the opening of Bids.
- I. To obtain Contract Documents and submit a Bid:
 - 1. Proceed to the Wade Trim website at: www.wadetrim.com/resources/bid-tab/.
 - 2. Click on the QuestCDN link and you then will be re-directed to our QuestCDN electronic bidding project list.
 - 3. Select the project as listed in the Advertisement for Bids from the list of projects. Prospective Bidders To submit a Bid, you must register for a free membership on QuestCDN and download the Contract Documents in digital form under “Download Bid Documents”. There is a non-refundable fee as stated in the Advertisement for Bids to download the documents and bid the project.
 - 4. You will be asked to sign into your account or create a free QuestCDN account by clicking the “Join” link. Contact QuestCDN at (952) 233-1632 or info@questcdn.com for assistance in membership registration, downloading the project, and VBid online bid submittal.
 - 5. The QUESTCDN Project Number for this project is listed in the Advertisement for Bids.
 - 6. To access the Bid Form, click the online bidding button at the top of bid advertisement. The on-line bid button will be available when the project is published and open for bidding.
 - 7. All addendums will be issued through the QuestCDN electronic bidding site. You must download the bid documents to be a plan holder to receive any addenda notices. It is the sole responsibility of the Bidder to obtain and review all addenda.

Part 2 Products (Not Used)

Part 3 Execution (Not Used)

End of Section

Proposal

Charter Township of Harrison
28151 L'Anse Creuse Road
Harrison Township, MI 48045

Re: Waterfront Park Shoreline Improvements

Gentlemen:

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

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

- a) Bidder has examined copies of all Contract Documents, (consisting of Plans dated April 10, 2024 and Project Manual dated April 10, 2024) which he understands and accepts as sufficient for the purpose, including any and all Addenda officially issued, the receipt of which has been acknowledged.
- b) Bidder has examined the surface and subsurface conditions where the Work is to be performed, the legal requirements and local conditions affecting cost, progress, furnishing or performance of the Work, and has made such independent investigations as Bidder deems necessary.
- c) Their Bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation and is not submitted in conformity with any Agreement or rules of any group, association, organization or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any person, firm or a corporation to refrain from bidding; and Bidder has not sought by collusion to obtain for himself any advantage over any other Bidder or over OWNER.

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

PROPOSAL (Continued)

<u>Item No.</u>	<u>Description</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Amount</u>
1	Waterfront Park Shoreline Improvements, Complete	1	L.S.	\$ _____	\$ _____
TOTAL CONTRACT PRICE					\$ _____

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

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

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

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

The Bidder by submitting a Bid agrees that time is of the essence and, if awarded Contract, that the Work will be Substantially Completed within 80 calendar days after the date when the Contract Time commences to run, and completed within 95 calendar days after the date when the Contract Time commences to run.

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

All engineering and inspection costs incurred after the final completion date shall be paid by the CONTRACTOR to the OWNER as specified in the Conditions of the Contract and Agreement.

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

The following documents are made a condition of this Proposal:

- a) Required Bid security in the form as prescribed:
- b) Legal Status of Bidder.

PROPOSAL (Continued)

Bidder's Name _____

By _____

Address _____

Phone No. _____

Fax. No. _____

email _____

Bid Bond Form

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____

as Principal, hereinafter called the Principal, and _____

a corporation duly organized under the laws of the State of _____, and duly authorized to transact business in the state of Michigan, as Surety, hereinafter called the Surety, are held and firmly bound unto _____ as OWNER, hereinafter called the OWNER, in the sum of _____ Dollars (\$ _____)

for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a Bid for _____

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

Signed and Sealed this _____ day of _____, 20 ____.

(Witness)

(Principal)

(Title)

(Witness)

(Surety)

(Title)

**Legal Status
of Bidder**

This Proposal is submitted in the name of:

(Print) _____

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

Street _____

City _____

State _____ Zip Code _____

The undersigned hereby declares that he has legal status checked below:

- SOLE PROPRIETOR
- SOLE PROPPRIETOR DOING BUSINESS UNDER AN ASSUMED NAME
- CO-PARTNERSHIP
The Assumed Name of the Co-Partnership is registered in the
County of _____, Michigan
- CORPORATION INCORPORATED UNDER THE LAWS OF THE STATE OF
_____. The Corporation is
 - AUTHORIZED TO CONDUCT BUSINESS IN THE STATE OF MICHIGAN
 - NOT NOW AUTHORIZED TO CONDUCT BUSINESS IN THE STATE OF MICHIGAN
 - POSSESS ALL REQUIRED LICENSES FOR THE WORK BEING BID
- LIMITED LIABILITY CORPORATION

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

NAME AND TITLE	HOME ADDRESS
_____	_____
_____	_____
_____	_____
_____	_____

Signed this ____ day of _____, 20__.

By (Signature)

Printed Name of Signer

Title

Contracting Requirements

Notice of Award

DATE _____, 20____

To: _____

Attention: _____

Project: _____

(Insert name of Project as it appears in Proposal)

Gentlemen:

Pursuant to the provisions of Article 1.11 of the Instructions to Bidders, you are hereby notified that the

(Insert OWNER)

during a _____ Meeting held

(Insert Type of Meeting)

_____, _____, 20____, has directed the acceptance of your Bid for the above-referenced Project
(Month) (Day) (Year)

in the amount of \$ _____ This project shall consist of

(Insert Contract Price)

(Insert Brief Description of Work)

as delineated in your Bid submitted to the _____

(Insert OWNER)

on _____

(Insert Date of Bid Opening)

Insert a second paragraph indicating that a specific number of blank Contract Documents may be picked up at a specific place (give name, address, city, state, zip code and telephone number)

or

Insert a second paragraph indicating that a specific number of blank Contract Documents accompany this Notice of Award

Please comply with the following conditions within 15 days of the date of this Notice of Award; that is by _____, 20____.

1. Deliver to the ENGINEER _____ fully executed counterparts of the Agreement including all the Contract Documents.
2. Deliver with the executed Agreement the Contract Security (Bonds), on the form included in the Contract Documents, as specified in the General Conditions (Article 5) and Supplementary Conditions (Article SC-5).
3. Deliver with the executed Agreement the Insurance Certificates (and other evidence of insurance) as specified in General Conditions (Article 5) or the Supplementary General Conditions (Article SC-5).
4. Please do not date Agreement and Contract Security (Bonds), as these will be dated by OWNER when executed by him.
5. (List other conditions, if applicable.)

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

Within ten (10) days after you comply with these conditions, OWNER will return to you two (2) fully signed counterparts of the Agreement with the Contract Documents attached.

(It is appropriate to also list the permits the Contractor is required to obtain and have them submitted prior to the Pre-Construction meeting)

In accordance with paragraph 2.05 of the General Conditions, please submit to the ENGINEER the required schedules prior to the scheduling of a Preconstruction Meeting.

(OWNER)

By _____
(AUTHORIZED SIGNATURE)

(TITLE)

cc: _____

(Copy to ENGINEER)

Agreement

This Agreement, made and entered into this _____ day of _____ in the year 20____ by and between Charter Township of Harrison hereinafter called OWNER, and _____ hereinafter called CONTRACTOR, in consideration of the mutual covenants hereinafter sent forth, agree as follows:

ARTICLE 1. WORK

CONTRACTOR shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

Waterfront Park Shoreline Improvements

ARTICLE 2. CONTRACT TIME

2.1 The Work will be substantially completed by April 18, 2025 as provided in paragraph 2.03 of the General Conditions, and completed and ready for final payment in accordance with paragraph 14.11 of the General Conditions by May 16, 2025.

2.2 All engineering and inspection costs incurred after the specified final completion date shall be paid by the CONTRACTOR to the OWNER prior to final payment authorization. Charges shall be made at such times and in such amounts as the ENGINEER shall invoice the OWNER, provided however said charges shall be in accordance with the ENGINEER's current rate schedule at the time the costs are incurred. The costs of ENGINEER incurred after the specified final completion date shall be deducted from the CONTRACTOR's progress payments.

2.3 Liquidated Damages. OWNER and CONTRACTOR recognize that time is of the essence of this Agreement and that OWNER will suffer financial loss if the Work is not Substantially Complete within the time specified in paragraph 2.1 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. They 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 Substantially Complete on time. Accordingly, instead of requiring any such proof, OWNER and CONTRACTOR agree that as liquidated damages for delay (but not as penalty) CONTRACTOR shall pay OWNER Five Hundred Dollars (\$500.00) for each day that expires after the time specified in paragraph 2.1 for Substantial Completion until the Work is Substantially Complete. Liquidated damages charged shall be deducted from the CONTRACTOR's progress payment.

ARTICLE 3. CONTRACT PRICE

3.1 OWNER shall pay CONTRACTOR as provided in the attached Proposal for performance of the Work in accordance with the Contract Documents.

ARTICLE 4. PAYMENT PROCEDURES

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

4.1 The person representing the CONTRACTOR who will submit written requests for progress payments shall be: _____

4.2 The person representing the OWNER to whom requests for progress payments are to be submitted shall be: Mr. Adam Wit, Clerk

4.3 The CONTRACTOR's representative, listed above, shall submit Applications for Payment on the form provided in the Contract Documents in accordance with Article 14 of the General Conditions. Applications for Payment will be processed as provided in the General Conditions.

ARTICLE 5. CONTRACTOR'S REPRESENTATIONS

In order to induce OWNER to enter into this Agreement, CONTRACTOR makes the following representations:

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

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

5.3 CONTRACTOR has made or caused to be made examinations, investigations and tests and studies of such reports and related data in addition to those referred to in paragraph 5.2 as he deems necessary for the performance of the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents; and no additional examinations, investigations, tests, reports or similar data are or will be required by CONTRACTOR for such purposes.

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

5.5 CONTRACTOR has given ENGINEER written notice of all conflicts, errors or discrepancies that he has discovered in the Contract documents and the written resolution thereof by ENGINEER is acceptable to CONTRACTOR.

ARTICLE 6. CONTRACT DOCUMENTS

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

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

6.2 This Agreement

6.3 Performance and other Bonds

6.4 Notice of Award

6.5 Notice to Proceed (if issued)

6.6 Conditions of the Contract (including General Conditions and Supplementary Conditions, if any)

6.7 Modifications to the Standard Specifications contained in Section 00 9120, Standard Specification Section Revisions.

6.8 Specifications contained within Division 01 through 49 of the Project Manual dated June 5, 2020

6.9 Plans consisting of sheets numbered C-0.0 through L-1.1 inclusive consisting of 19 sheets with each sheet bearing the following general title: Waterfront Park Shoreline Improvements

6.10 Addenda numbers ____ to ____, inclusive

6.11 Documentation submitted by CONTRACTOR prior to Notice of Award

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

ARTICLE 7. MISCELLANEOUS

7.1 Terms used in this Agreement which are defined in Article 1 of the General Conditions shall have the meanings indicated in the General Conditions.

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

7.3 OWNER and CONTRACTOR each binds himself, his partners, successors, assigns and legal representatives to the other party hereto, his partners, successors, assigns and legal representatives in respect to all covenants, agreements and obligations contained in the Contract Documents.

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

IN WITNESS WHEREOF, the parties hereto have signed this Agreement in five (5) counterparts. Two (2) counterparts each have been delivered to OWNER and CONTRACTOR, one counterpart has been delivered to the ENGINEER. All portions of the Contract Documents have been signed or identified by OWNER and CONTRACTOR.

This Agreement will be effective on _____, 20__.

OWNER Charter Township of Harrison

CONTRACTOR _____

By _____

By _____

Attest _____

Attest _____

Address for giving notices

Address for giving notices

License No. _____

Agent for service of process: _____

Notice to Proceed

DATED _____, 20__

To: _____

Attention: _____

Project: _____

Gentlemen:

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

(Insert a second paragraph describing the portion(s) of the Project that the CONTRACTOR can proceed with at this time, if different than the total Project.)

In accordance with paragraph 2.05 of the General Conditions, please submit to the ENGINEER the required schedules prior to the scheduling of a Preconstruction Meeting.

(Delete above paragraph if schedules have already been received.)

Also, in accordance with paragraph 2.05 of the General Conditions, please request a Preconstruction Meeting from the ENGINEER prior to delivery of any materials or start of any construction. A minimum of three (3) full working days notice is required to set up the Preconstruction Meeting. Also, please notify the ENGINEER three (3) full working days in advance of any staking requirements or other activity on the Project.

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

(It is also appropriate to include a paragraph telling the Contractor what permits he needs to obtain and informing him these permits should be obtained prior to scheduling the Pre-Construction meeting)

(OWNER)

By _____
(AUTHORIZED SIGNATURE)

(TITLE)

cc:

(Copy to ENGINEER)

Performance Bond

Bond No. _____

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

THE CONDITION OF THIS OBLIGATION is such that, WHEREAS, the above Principal has entered into a contract with the said Obligee, dated the _____ day of _____, 20____ for _____ which contract is herein referred to and made a part hereof as fully and to the same extent as if the same were entirely written herein, and

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

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

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

Signed and sealed this _____ day of _____ 20____.

Signed, sealed and delivered in the presence of:

Witness for CONTRACTOR

(Principal)

(Title)

By _____

Witness for Surety

(Surety)

(Title)

By _____

Attorney-In-Fact (Seal)

Address

Address of Surety

City Zip Code

City Zip Code

Telephone

Telephone

Labor and Material Payment Bond

Bond No. _____

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

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

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

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

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

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

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

Signed and sealed this _____ day of _____ 20 ____.

Signed, sealed and delivered
in the presence of:

Witness for CONTRACTOR

(Principal)

(Title)

By _____

Witness for Surety

(Surety)

(Title)

By _____

Attorney-In-Fact (Seal)

Address

Address of Surety

City Zip Code

City Zip Code

Telephone

Telephone

ENGINEER'S CERTIFICATE FOR PAYMENT

Job No. _____ Certificate No. _____ Date _____

OWNER: _____

CONTRACTOR: _____

Project: _____

Contract Date: _____

Completion Date: _____ Extended To: _____

Substantial Completion Date: _____ Extended To: _____

Original Contract Price	\$ _____	Total Earned To Date	\$ _____
Adjustments to Quantities	\$ _____	Retention	\$ _____
Extras	\$ _____	Deductions	\$ _____
Total Change Orders	\$ _____	Total Withheld	\$ _____
Amended Contract Price	\$ _____	Total Net Due	\$ _____
Less TOTAL NET DUE	\$ _____	Less Previous Certificates	\$ _____
Balance on Contract	\$ _____	Total Balance Due This Certificate	\$ _____

ENGINEER'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on the data comprising the above application, the ENGINEER to the best of his knowledge, information, and belief and subject to the limitations stated in the Contract Documents certifies to the OWNER that; (1) Work has progressed to the point indicated, (2) that the quality of the Work is in accordance with the Contract Documents, and (3) the CONTRACTOR is entitled to payment of the Total Balance Due This Certificate.

Certified _____ ENGINEER _____ Date _____
 Recommended _____ Date _____

**CONTRACTOR'S
APPLICATION FOR PAYMENT**

Job No. _____ Application No. _____ Date _____, 20____

OWNER: _____

CONTRACTOR: _____

Project: _____

Period of this Application for Payment and Declaration _____, 20____ to _____, 20____

Contract Dated _____, 20____

CONTRACTOR'S CERTIFICATION

Total Earned to Date.....\$_____

Less Total Earned to Date, Previous Certificate No.\$_____

Total Earned This Application.....\$_____

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

(CONTRACTOR)

By: _____

Title: _____

CONTRACTOR'S DECLARATION

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

(CONTRACTOR)

By: _____

Title: _____

PAYMENT SCHEDULE

JOB NO. _____ CERTIFICATE NO. _____ DATE: _____

PROJECT: _____ PERIOD: _____

ITEM OF WORK	UNIT	ORIGINAL ESTIMATED QUANTITY	UNIT PRICE	PERIOD QUANTITY	PERIOD AMOUNT	TOTAL QUANTITY TO DATE	TOTAL AMOUNT TO DATE

Substitution Request Form

SECTION #	PARA #	SPECIFIED PRODUCT	PROPOSED SUBSTITUTION
-----------	--------	-------------------	-----------------------

- | | | | |
|----|--|----|----|
| A. | Does specified product exceed, in any respect proposed substitution? | _Y | _N |
| B. | Does substitution affect dimensions shown on Plans? | _Y | _N |
| C. | Does substitution affect other trades more than original product? | _Y | _N |
| D. | Does warranty differ from that specified? | _Y | _N |
| E. | Does substitution affect cost to OWNER? | _Y | _N |
| F. | Does substitution result in any license fee or royalty? | _Y | _N |

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

1. Explain any differences between proposed substitution and specified product.
2. Summarize experience with product and manufacturer in Project area.
3. Attach complete technical data and literature.

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

For use by ENGINEER

Submitted by: _____
Position: _____	. .
Company: _____	. .
Address: _____	. .
_____	. .
_____	. .
Date: _____	. .
Telephone: _____	. .
Signature: _____

Section 00 6370 Change Proposal Form

Project:	Date:	
Contractor:		
Owner:		
<p>This Change Proposal is submitted in accordance with Paragraph 10.06 of the General Conditions.</p> <p>If this Change Proposal is accepted, either in whole or in part, a Change Order will be issued to modify the Contract Documents accordingly.</p>		
<p>Detailed Description of Proposed Change:</p> 		
<p>Attachments: (List documents attached supporting requested change):</p>		
A.		
B.		
C.		
D.		
E.		
<p><u>CHANGE IN CONTRACT PRICE</u></p> <p>[Increase] [Decrease] of this requested in this Change Proposal: \$</p>	<p><u>CHANGE IN CONTRACT TIME</u></p> <p>[Increase] [Decrease] of this requested Change Proposal: Substantial completion (days): Ready for final payment (days):</p>	
<p>Engineer's Decision on Change Proposal:</p> 		
<p>Engineer:</p> <p>By: _____ <i>Engineer (Authorized Signature)</i></p> <p>Date: _____</p>	<p>Owner:</p> <p>By: _____ <i>Owner (Authorized Signature)</i></p> <p>Date: _____</p>	<p>Contractor:</p> <p>By: _____ <i>Contractor (Authorized Signature)</i></p> <p>Date: _____</p>

Certificate of Substantial Completion

PROJECT: _____

OWNER: _____

CONTRACTOR: _____

CONTRACT DATE: _____ PROJECT NO.: _____

DATE OF ISSUANCE: _____

PROJECT OR DESIGNATED PORTION SHALL INCLUDE: _____

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

DEFINITION OF DATE OF SUBSTANTIAL COMPLETION

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

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

The responsibilities of the OWNER and the CONTRACTOR for security, maintenance, heat, utilities, damage to the Work and insurance shall be as follows:

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

OWNER shall have 45 days after receipt of this certificate during which he may make written objection to ENGINEER and CONTRACTOR as to any provisions of the certificate or attached list. Such objection may be cause for this Certificate of Substantial Completion to be null and void.

ENGINEER

By

Date

Section 00 6520 Sworn Statement

STATE OF MICHIGAN

COUNTY OF _____}

_____ being duly sworn, deposes and says:
That _____ is the (CONTRACTOR)(subcontractor) for an improvement to the following described real property situated in _____ County, Michigan described as follows:

(Insert legal description of property)

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

Name of Subcontractor, Supplier, or Laborer	Type of Improvement Furnished	Total Contract Price	Amount Already Paid	Amount Currently Owing	Balance to Complete (optional)	Amount of Laborer Wages Due but Unpaid	Amount of laborer fringe benefits and withholdings due but unpaid
TOTALS:							

(Some columns are not applicable to all persons listed)

(Continued)

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

Deponent further says that he or she makes the foregoing statement as the (CONTRACTOR) (Subcontractor) or as _____ of the (CONTRACTOR) (Subcontractor) for the purpose of representing to the OWNER or lessee of the described on the reverse side premises and his or her agents that the property described on the reverse side is free from claims of construction liens, or the possibility of construction liens, except as specifically set forth on the reverse side and except for claims of construction liens by laborers which may be provided pursuant to section 109 of the construction lien act, Act No. 497 of the Public Acts of 1980, as amended, being section 570.1109 of the Michigan Compiled Laws.

WARNING TO OWNER: AN OWNER OR LESSEE OF THE PROPERTY DESCRIBED ON THE REVERSE SIDE MAY NOT RELY ON THIS SWORN STATEMENT TO AVOID THE CLAIM OF A SUBCONTRACTOR, SUPPLIER, OR LABORER WHO HAS PROVIDED A NOTICE OF FURNISHING OR A LABORER WHO MAY PROVIDE A NOTICE OF FURNISHING PURSUANT TO SECTION 109 OF THE CONSTRUCTION LIEN ACT TO THE DESIGNEE OR TO THE OWNER OR LESSEE IF THE DESIGNEE IS NOT NAMED OR HAS DIED.

(Deponent)

WARNING TO DEPONENT: A PERSON, WHO WITH INTENT TO DEFRAUD, GIVES A FALSE SWORN STATEMENT IS SUBJECT TO CRIMINAL PENALTIES AS PROVIDED IN SECTION 110 OF THE CONSTRUCTION LIEN ACT, ACT NO. 497 OF THE PUBLIC ACTS OF 1980, AS AMENDED, BEING SECTION 570.1110 OF THE MICHIGAN COMPILED LAWS.

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

Notary Public

_____ County, Michigan

My Commission Expires _____

INSTRUCTIONS

1. A Sworn Statement in the preceding form must be provided before any CONTRACTOR or Subcontractor can file a Complaint, Cross-Claim, or Counter-Claim to enforce a construction lien.
2. An OWNER or lessee may withhold payment to a CONTRACTOR or Subcontractor who has not provided a Sworn Statement. An OWNER or lessee may withhold from a CONTRACTOR or Subcontractor who has provided a Sworn Statement the amount sufficient to pay all sums shown on the statement as owing Subcontractors, Suppliers, and laborers, or the amount shown to be due to lien claimants who have provided Notices of Furnishing pursuant to the Construction Lien Act of 1980.
3. An OWNER or lessee may rely on a Sworn Statement to avoid a lien claim unless the lien claimant has provided the OWNER or lessee with a Notice of Furnishing pursuant to the Construction Lien Act of 1980.
4. If the contract provides for payments by the OWNER to the general contractor, if any, in the normal course of construction, but the OWNER elects to pay lien claimants directly, the first time the OWNER elects to make payment directly to a lien claimant he or she shall provide at least 5 business days' notice to the general contractor of the intention to make direct payment. Subsequent direct disbursements to lien claimants need not be preceded by the 5-day notice provided in this section unless the OWNER first returns to the practice of paying all sums to the general contractor.

Section 00 7200 General Conditions

<u>Article 1</u>	<u>Definitions</u>	6
<u>Article 2</u>	<u>Preliminary Matters</u>	13
<u>Article 3</u>	<u>Contract Documents Intent and Reuse</u>	14
<u>Article 4</u>	<u>Availability of Lands; Subsurface and Physical Conditions; Reference Points</u>	18
<u>Article 5</u>	<u>Bonds and Insurance</u>	23
<u>Article 6</u>	<u>CONTRACTOR's Responsibilities</u>	28
<u>Article 7</u>	<u>Work by Others</u>	41
<u>Article 8</u>	<u>OWNER's Responsibilities</u>	42
<u>Article 9</u>	<u>ENGINEER's Status During Construction</u>	43
<u>Article 10</u>	<u>Amending the Contract Documents; Changes in the Work</u>	47
<u>Article 11</u>	<u>Claims</u>	52
<u>Article 12</u>	<u>Cost of the Work; Allowances; Unit Price Work</u>	53
<u>Article 13</u>	<u>Tests and Inspection; Correction, Removal or Acceptance of Defective Work</u>	60
<u>Article 14</u>	<u>Payments to CONTRACTOR and Completion</u>	63
<u>Article 15</u>	<u>Suspension of Work and Termination</u>	71
<u>Article 16</u>	<u>Final Resolution of Disputes</u>	74
<u>Article 17</u>	<u>Miscellaneous</u>	75

Table of Contents

Article 1	Definitions.....	6
1.01	Defined Terms.....	6
1.02	Terminology	12
Article 2	Preliminary Matters.....	13
2.01	Delivery of Bonds and Insurance.....	13
2.02	Copies of Documents	13
2.03	Commencement of Contract Time; Notice to Proceed	13
2.04	Starting the Project.....	13
2.05	Preconstruction Meeting.....	13
2.06	Electronic Transmittals.....	14
Article 3	Contract Documents Intent and Reuse.....	14
3.01	Intent.....	14
3.02	Reference to Standards and Specifications of Technical Societies.....	15
3.03	Reporting and Resolving Discrepancies.....	15
3.04	Requirements of Contract Documents.....	16
3.05	Order of Precedence.....	16
3.06	Amending and Supplementing Contract Documents.....	17
3.07	Reuse of Documents.....	17
3.08	Electronic Data.....	17
Article 4	Availability of Lands; Subsurface and Physical Conditions; Reference Points.....	18
4.01	Availability of Lands.....	18
4.02	Subsurface and Physical Conditions; Investigations and Reports.....	18
4.03	Unforeseen Physical Conditions	19
4.04	Utilities	20
4.05	Reference Points.....	22
4.06	Constituents of Concern.....	22
Article 5	Bonds and Insurance	23
5.01	Performance and Other Bonds	23
5.02	Licensed Insurers and Sureties	24
5.03	Insurance	24
5.04	Limits of Liability	26
5.05	Notice of Cancellation or Intent Not to Renew.....	26
5.06	Evidence of Coverage.....	27
5.07	Qualification of Insurers.....	27
5.08	Damage Claims - Acknowledgment and Reports	27
5.09	Cost of Insurance.....	27

5.10	Waiver of Rights	27
5.11	Receipt and Application of Insurance Proceeds	28
Article 6	CONTRACTOR's Responsibilities.....	28
6.01	Supervision and Superintendence	28
6.02	Labor and Working Hours	29
6.03	Services, Materials and Equipment.....	29
6.04	Substitutes and "Or-Equals"	29
6.05	Concerning Subcontractors.....	31
6.06	Patent Fees and Royalties	32
6.07	Permits and Licenses	33
6.08	Laws and Regulations.....	33
6.09	Taxes	33
6.10	Use of Premises.....	34
6.11	Removal of Debris and Cleaning.....	34
6.12	Loading Structures	34
6.13	Protection of Utilities.....	34
6.14	Record Documents	35
6.15	Safety and Protection.....	35
6.16	Safety Representative.....	36
6.17	Hazard Communication Program.....	36
6.18	Emergencies	36
6.19	Shop Drawings and Samples.....	36
6.20	Submittal Procedures	36
6.21	ENGINEER's Review.....	37
6.22	Continuing the Work.....	38
6.23	CONTRACTOR's General Warranty and Guarantee.....	38
6.24	Indemnification	39
6.25	Delegation of Professional Design Services	40
Article 7	Work by Others.....	41
7.01	Related Work at Site	41
Article 8	OWNER's Responsibilities	42
8.01	Communication to CONTRACTOR.....	42
8.02	Replacement of ENGINEER.....	42
8.03	Furnishing Data	42
8.04	Pay When Due	42
8.05	Lands and Easements; Reports and Tests	42
8.06	Change Orders.....	42
8.07	Inspections, Tests, and Approvals.....	42

8.08	Limitation on OWNER's Responsibility.....	43
8.09	Undisclosed Hazardous Materials.....	43
8.10	OWNER'S Designated Representative.....	43
Article 9	ENGINEER's Status During Construction.....	43
9.01	OWNER's Representative.....	43
9.02	Visits to Site.....	43
9.03	Resident Project Representative.....	43
9.04	Clarifications and Interpretations.....	45
9.05	Authorized Variations in Work - Field Order.....	45
9.06	Rejecting Defective Work.....	45
9.07	Shop Drawings, Change Orders, and Payments.....	45
9.08	Determinations for Unit Price Work.....	46
9.09	Decisions on Disagreements, Claims.....	46
9.10	Limitations on ENGINEER's Responsibilities.....	46
Article 10	Amending the Contract Documents; Changes in the Work.....	47
10.01	Amending and Supplementing Contract Documents.....	47
10.02	OWNER-Authorized Changes in the Work.....	48
10.03	Unauthorized Changes in the Work.....	48
10.04	Change of Contract Price.....	49
10.05	Change of Contract Times.....	50
10.06	Change Proposals.....	50
10.07	Execution of Change Orders.....	51
10.08	Notification to Surety.....	52
Article 11	Claims.....	52
11.01	Claims.....	52
Article 12	Cost of the Work; Allowances; Unit Price Work.....	53
12.01	Cost of Work.....	53
12.02	Allowances.....	57
12.03	Unit Price Work.....	57
12.04	Delays in CONTRACTOR's Progress.....	58
Article 13	Tests and Inspection; Correction, Removal or Acceptance of Defective Work.....	60
13.01	Access to Work.....	60
13.02	Tests and Inspections.....	60
13.03	Uncovering Work.....	61
13.04	Defective Work.....	61
13.05	OWNER May Stop the Work.....	62
13.06	Correction or Removal of Defective Work.....	62
13.07	Guarantee Period.....	62

13.08	Acceptance of Defective Work.....	62
13.09	OWNER May Correct Defective Work.....	63
Article 14	Payments to CONTRACTOR and Completion	63
14.01	Schedules	63
14.02	Application for Progress Payment	64
14.03	Retainage	64
14.04	Review of Applications for Progress Payment.....	65
14.05	Payment Becomes Due.....	66
14.06	CONTRACTOR's Warranty of Title	67
14.07	Substantial Completion.....	68
14.08	Partial Utilization.....	68
14.09	Final Inspection.....	69
14.10	Final Application for Payment.....	69
14.11	Final Payment and Acceptance	70
14.12	Final Completion Delayed.....	70
14.13	Waiver of Claims	71
14.14	Late Payments.....	71
Article 15	Suspension of Work and Termination.....	71
15.01	OWNER May Suspend Work	71
15.02	OWNER May Terminate for Cause	71
15.03	Termination for Convenience.....	73
15.04	CONTRACTOR May Stop Work or Terminate.....	74
Article 16	Final Resolution of Disputes	74
16.01	Methods and Procedures.....	74
Article 17	Miscellaneous.....	75
17.01	Giving Notice	75
17.02	Computation of Time.....	75
17.03	General	75
17.04	Professional Fees and Court Costs Included.....	75
17.05	Nondiscrimination of Employment	75
17.06	Post Completion Date Engineering and Inspection Costs.....	75
17.07	Waiver of Consequential Damages	76
17.08	No Waiver.....	76
17.09	Controlling Law	76
17.10	Headings	76

Article 1 Definitions

1.01 Defined Terms

- A. Wherever used in these General Conditions or in the other Contract Documents, the following terms have the meanings indicated which are applicable to both the singular and plural thereof:
1. Addenda -- Written or graphic instruments issued prior to the opening of Bids which clarify, correct or change the Contract Documents.
 2. Agreement -- The written Agreement between OWNER and CONTRACTOR covering the Work to be performed; other Contract Documents are attached to the Agreement and made a part thereof as provided therein.
 3. Application and Certificate for Payment -- The form included in the Contract Documents which is to be used by CONTRACTOR in requesting progress or final payment and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. Bid -- The offer or proposal of the bidder submitted on the prescribed form setting forth the price(s) for the Work to be performed.
 5. Bidding Requirements -- The Advertisement for Bids, Instructions to Bidders, Supplementary Instructions to Bidders, Proposal, Legal Status of Bidder, Bid Bond, and any other documents identified in the Proposal, to be submitted with the Bid.
 6. Bonds -- Bid, Performance and Payment bonds and other instruments of security.
 7. Change Order -- A written order to CONTRACTOR, reviewed by the ENGINEER and signed by OWNER, issued after execution of the Contract, authorizing a change in the Work or an adjustment in the Contract Price or the Contract Time. The Contract Price and Contract Time may be changed only by Change Order. A Change Order signed by CONTRACTOR indicates his agreement therewith, including that the Change Order constitutes a final adjustment in the Contract Price or Contract Time for all issues addressed or described in the Change Order.
 8. Change Proposal -- A written request by CONTRACTOR, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by ENGINEER concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
 9. Claims --

- a. A demand or assertion by OWNER directly to CONTRACTOR, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by ENGINEER concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting ENGINEER's decision regarding a Change Proposal; seeking resolution of a contractual issue that ENGINEER has declined to address; or seeking other relief with respect to the terms of the Contract.
 - b. A demand or assertion by CONTRACTOR directly to OWNER, duly submitted in compliance with the procedural requirements set forth herein, contesting ENGINEER's decision regarding a Change Proposal, or seeking resolution of a contractual issue that ENGINEER has declined to address.
 - c. A demand or assertion by OWNER or CONTRACTOR, duly submitted in compliance with the procedural requirements set forth herein, arising after ENGINEER has issued a recommendation of final payment.
 - d. A demand for money or services by a third party is not a Claim.
10. Constituents of Concern -- Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
 11. Contract -- The entire and integrated written contract between OWNER and CONTRACTOR concerning the Work
 12. Contract Documents -- Those items so designated in the Agreement, and which together comprise the Contract.
 13. Contract Price -- The monies or other considerations payable by OWNER to CONTRACTOR for completion of acceptable Work in accordance with the Contract Documents as stated in the Agreement.
 14. Contract Time -- The number of days or the date stated in the Agreement:
 - a. to achieve Substantial Completion of all or any specified portions of the Work, and;
 - b. to complete the Work so that it is ready for final payment as evidenced by ENGINEER's written recommendation of final payment in accordance with paragraph 14.11.
 15. CONTRACTOR -- The person, firm or corporation with whom OWNER has entered into the Agreement.
 16. Cost of the Work -- The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined in paragraph 12.01.

17. Day -- A calendar day of 24 hours measured from midnight to the next midnight.
18. Defective -- An adjective which when modifying the word Work refers to Work that is unsatisfactory, faulty or deficient, in that it does not conform to the Contract Documents or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or has been damaged prior to ENGINEER's recommendation of final payment.
19. Drawings -- See Plans.
20. Effective Date of Agreement -- The date indicated in the Agreement on which it becomes effective, but if no such date is indicated it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
21. Electronic Document -- Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.
22. Electronic Means -- Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow:
 - a. the transmission or communication of Electronic Documents;
 - b. the documentation of transmissions, including sending and receipt;
 - c. printing of the transmitted Electronic Document by the recipient;
 - d. the storage and archiving of the Electronic Document by sender and recipient; and
 - e. the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.
23. ENGINEER -- The person, firm, or corporation identified in the Supplementary Instructions to Bidders hired by OWNER to prepare Plans and Specifications for the Project and to assist OWNER in interpreting Plans and Specifications during the performance of the Work. ENGINEER's authority and responsibility are set forth in the Contract between OWNER and ENGINEER. CONTRACTOR acknowledges and agrees that ENGINEER's obligations and duties under ENGINEER's contract with OWNER are obligations and duties to OWNER only, and ENGINEER has no independent obligation to CONTRACTOR of any kind, including but not limited to providing services, or to take any action or to refrain from taking action on behalf of CONTRACTOR or any Subcontractor, Sub-Subcontractor or Supplier.
24. Field Order -- A written order issued by ENGINEER which clarifies or interprets the Contract Documents or orders minor changes in the Work in accordance with paragraphs 9.04 and 9.05 but which does not involve a change in the Contract Price or the Contract Time.

25. Hazardous Environmental Conditions -- The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.
 - a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.
 - b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.
 - c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.
26. Laws and Regulations; Laws or Regulations Any and all applicable laws, rules, regulations, ordinances, codes and orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction.
27. Lump Sum -- Construction Work where the OWNER pays a single stipulate price (Lump Sum) for the entire scope of Work; plus or minus alternates and/or allowances. However, unit prices may be required for individual items of Work for the purposes of changes, additions, or deletions.
28. Milestone -- A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of the Work.
29. Notice of Award -- The written notice by OWNER to the apparent successful Bidder stating that, upon compliance by the apparent successful Bidder with the conditions precedent enumerated therein, within the time specified, OWNER will sign and deliver the Agreement.
30. Notice to Proceed -- A written notice given by OWNER to CONTRACTOR (with a copy to ENGINEER) fixing the date on which the Contract Time will commence to run and on which CONTRACTOR shall start to perform his obligation under the Contract Documents.
31. OWNER -- The public body or authority, corporation, limited liability company, association, partnership, or individual with whom CONTRACTOR has entered into the Agreement and for whom the Work is to be provided and as identified in the Supplementary Instructions to Bidders.
32. Partial Utilization -- Use by OWNER of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.
33. Plans -- The part of the Contract Documents which graphically show the extent, character and Scope of the Work to be furnished and performed by CONTRACTOR and which have been prepared or approved by the ENGINEER or OWNER; sometimes also referred to as Drawings.

34. Progress Schedule -- A schedule, prepared and maintained by CONTRACTOR, describing the sequence and duration of the activities comprising CONTRACTOR's plan to accomplish the Work within the Contract Times.
35. Project -- The total construction of which the Work to be provided under the Contract Documents may be the whole or a part as indicated elsewhere in the Contract Documents.
36. Project Manual -- The volume assembled for the Project which may include, among other parts, Procurement Requirements, Contracting Requirements and Specifications.
37. Proposal -- The offer or bid of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
38. Radioactive Material -- Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 as amended.
39. Resident Project Representative -- The authorized representative of ENGINEER who may be assigned to the Site or any part thereof.
40. Samples -- Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
41. Schedule of Submittals -- A schedule, prepared and maintained by CONTRACTOR, of required Submittals and the time requirements for ENGINEER's review of the Submittals.
42. Schedule of Values -- A schedule, prepared and maintained by CONTRACTOR, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing CONTRACTOR's Applications for Payment.
43. Shop Drawings -- All drawings, diagrams, illustrations, schedules and other data or information required by the Contract Documents which are specifically prepared or assembled by or for CONTRACTOR and submitted by CONTRACTOR to illustrate material or equipment for some portion of the Work.
44. Site -- Lands or areas indicated in the Contract Documents as being furnished by OWNER upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by OWNER which are designated for the use of CONTRACTOR.
45. Specifications -- That part of the Contract Documents which consist of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.
 - a. Project Specifications are those portions of the Contract Documents which have been prepared specifically for this Project and which are identified by the job number in the lower right-hand corner of each page.
 - b. Standard Specifications are Specification sections that are the same from Project to Project as of the revision date shown in the lower left-hand corner of the page.

- c. Standard Specification Section Revisions -- Section 00 9120 of the Specifications which amends or supplements the Standard Specification Sections.
- 46. Subcontractor -- An individual, firm or corporation having a direct contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the Site.
- 47. Submittal -- A written or graphic document, prepared by or for CONTRACTOR, which the Contract Documents require CONTRACTOR to submit to ENGINEER, or that is indicated as a Submittal in the Schedule of Submittals accepted by ENGINEER. Submittals may include Shop Drawings and Samples; schedules; product data; OWNER-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers' instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by ENGINEER, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.
- 48. Substantial Completion -- The Work (or a specified part thereof) has progressed to the point where, in the opinion of ENGINEER as evidenced by the Certificate of Substantial Completion, it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it was intended; or if no such certificate is issued, when the Work is complete and ready for final payment as evidenced by ENGINEER's written recommendation of final payment in accordance with paragraph 14.11. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.
- 49. Supplementary Conditions -- The part of the Contract Documents which amends or supplements these General Conditions.
- 50. Supplementary Instructions to Bidders -- The part of the Contract Documents which amends or supplements the Instructions to Bidders.
- 51. Supplier -- A manufacturer, fabricator, supplier, distributor, material man, or vendor having a direct contract with CONTRACTOR, or with any Subcontractor, or with OWNER, to furnish materials or equipment to be incorporated in the Work by CONTRACTOR or any Subcontractor.
- 52. Unit Price -- Construction Work where the OWNER pays a fixed sum (Unit Price) per each completed unit of Work. Units are listed on the Proposal Form.

53. Utilities – Underground or above ground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments, and any structures or encasements containing such facilities, which have been installed to furnish any of the following services or materials: electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems, water or other liquids or chemicals.
54. Work -- The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work includes and is the result of performing or furnishing labor and furnishing and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing documents, all as required by the Contract Documents.
55. Work Change Directive -- A written directive to CONTRACTOR, issued on or after the Effective Date of the Agreement and signed by OWNER and reviewed by ENGINEER, ordering an addition, deletion or revision in the Work, or responding to differing or unforeseen physical conditions under which the Work is to be performed as provided in paragraph 4.03 or to emergencies under paragraph 6.18. A Work Change Directive will not change the Contract Price or Contract Time but is evidence that the parties expect that the change directed or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Time as provided in paragraph 10.01.

1.02 Terminology

- A. The following words, terms, or phrases are not defined but, when used in the Contract Documents, have the following meaning:
 1. Whenever in the Contract Documents the terms “as ordered,” “as directed,” “as required,” “as allowed,” “as approved” or terms of like effect or import are used; or the adjectives “reasonable,” “suitable,” “acceptable,” “proper” or “satisfactory” or adjectives of like effect or import are used to describe a requirement, direction, review or judgment of ENGINEER as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate, in general, the completed Work for compliance with the technical requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to ENGINEER any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.10 or any other provision of the Contract Documents.
 2. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

3. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 4. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 5. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of CONTRACTOR, “provide” is implied.
- B. Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

Article 2 Preliminary Matters

2.01 Delivery of Bonds and Insurance

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

2.02 Copies of Documents

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

2.03 Commencement of Contract Time; Notice to Proceed

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

2.04 Starting the Project

- A. CONTRACTOR shall start to perform the Work within 10 days of when the Contract Time commences to run, but no Work shall be done at the Site prior to the date on which the Contract Time commences to run. CONTRACTOR shall notify the ENGINEER at least 3 working days in advance of the time he intends to start Work.

2.05 Preconstruction Meeting

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

- B. Prior to the scheduling of the Preconstruction Meeting, CONTRACTOR shall submit to ENGINEER for review:
 - 1. A preliminary Progress Schedule indicating the starting and completion dates of the various stages of the Work, including any Milestones specified in the Contract Documents;
 - 2. A preliminary Schedule of Submittals which will list each required Submittal and the times for submitting, reviewing and processing such Submittal;
 - 3. An estimated monthly payment schedule, and a preliminary Schedule of Values for all of the Work.
- C. The Preconstruction Meeting will be held for review and acceptance of the schedules, to establish procedures for handling Shop Drawings and other Submittals, for processing Applications for Payment, and to establish a working understanding among the parties as to the Work.

2.06 Electronic Transmittals

- A. Except as otherwise stated elsewhere in the Contract, the 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 and Reuse

3.01 Intent

- A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. ENGINEER will issue clarifications and interpretations of the Contract Documents as provided herein.

- F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon OWNER and CONTRACTOR, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.
- G. Nothing in the Contract Documents creates:
 - 1. any contractual relationship between OWNER or ENGINEER and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or
 - 2. any obligation on the part of OWNER or ENGINEER to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations; or
 - 3. any obligation on the part of ENGINEER to CONTRACTOR.

3.02 Reference to Standards and Specifications of Technical Societies

- A. Reference to standards, specifications, manuals or codes of any technical society, organization or association, or to the Laws or Regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard, specification, manual, or Laws or Regulations in effect at the time of opening of Bids or, on the effective date of the Agreement if there were no Bids, except as may be otherwise specifically stated in the Contract Documents.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any Work, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result shall be furnished and performed whether or not it is specifically called for.
- C. No provision of any standard, specification, manual, code or instruction shall be effective to change the duties and responsibilities of OWNER, CONTRACTOR or ENGINEER, or any of their Subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall it be effective to assign to OWNER, ENGINEER or any of ENGINEER's consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of paragraph 9.10 or any other provision of the Contract Documents.

3.03 Reporting and Resolving Discrepancies

- A. Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. CONTRACTOR has a duty to and shall promptly report in writing to ENGINEER any conflict, error, ambiguity, or discrepancy which CONTRACTOR should reasonably have discovered and shall obtain a written interpretation or clarification from ENGINEER before proceeding with any Work affected thereby.

- B. If, during the performance of the Work, CONTRACTOR discovers any conflict, error, ambiguity or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, CONTRACTOR shall report it to ENGINEER in writing at once, and, CONTRACTOR shall not proceed with the Work affected thereby (except in an emergency as authorized by paragraph 6.18) until receiving written instruction or clarification from ENGINEER or OWNER. However, CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any such conflict, error, ambiguity or discrepancy unless CONTRACTOR knew or reasonably should have known thereof.
- C. Except as otherwise specifically stated in the Contract Documents or as may be provided by amendment or supplement issued by one of the methods indicated in paragraph 3.05, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity or discrepancy between the provisions of the Contract Documents and;
 - 1. the provisions of any standard, specification, manual, code or instruction (whether or not specifically incorporated by reference in the Contract Documents); or
 - 2. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 Requirements of Contract Documents

- A. During the performance of the Work and until final payment, CONTRACTOR and OWNER shall submit to 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 paragraph 11.01.

3.05 Order of Precedence

- A. In resolving conflicts, errors or discrepancies between Plans and Specifications,
 - 1. figured dimensions shall govern over scaled dimensions;
 - 2. Plans shall govern over Standard Specifications;
 - 3. and Project Specifications shall govern over Standard Specifications and Plans.

3.06 Amending and Supplementing Contract Documents

- A. The Contract Documents may be amended to provide for additions, deletions and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways:
 - 1. a Field Order (pursuant to paragraph 9.05), or,
 - 2. a Change Order (pursuant to paragraph 10.01.A.1), or
 - 3. a Work Change Directive Order (pursuant to paragraph 10.01.A.2)
- B. In addition, the requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, in one or more of the following ways:
 - 1. a Field Order (pursuant to paragraph 9.05),
 - 2. ENGINEER's review of a Shop Drawing or Sample (pursuant to paragraph 6.21), or
 - 3. ENGINEER's written interpretation or clarification (pursuant to paragraph 9.04).

3.07 Reuse of Documents

- A. Neither CONTRACTOR nor any Subcontractor, manufacturer, fabricator, Supplier, distributor, or other person or organization performing or furnishing any of the Work under a direct or indirect contract with OWNER:
 - 1. shall have or acquire any title to or ownership rights in any of the Plans, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of ENGINEER or ENGINEER's Consultant, and
 - 2. they shall not reuse any of such Plans, Specification, other documents or copies on extensions of the Project or any other project without written consent of OWNER and ENGINEER and specific written verification or adaptation by ENGINEER.

3.08 Electronic Data

- A. Except as otherwise stated elsewhere in the Contract Documents, OWNER, ENGINEER and CONTRACTOR may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information and graphics, including but not limited to Shop Drawings and other Submittals, in electronic media or digital format, either directly or through access to a secure Project website.
- B. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

Article 4 Availability of Lands; Subsurface and Physical Conditions; Reference Points

4.01 Availability of Lands

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

4.02 Subsurface and Physical Conditions; Investigations and Reports

- A. Reference is made to the Supplementary Conditions for identification of those reports of investigations and tests of subsurface and physical conditions at the Site or otherwise affecting cost, progress or performance of the Work which have been reviewed in preparation of the Contract Documents. Such reports are not guaranteed as to accuracy or completeness and are not part of the Contract Documents.
- B. The locations of utilities or other physical conditions relating to existing surface or subsurface structures at or contiguous to the Site as shown on the Plans are taken from drawings from sources believed to be reliable. Neither the OWNER nor ENGINEER will be responsible for any omissions of, or variations from, the indicated location of existing utilities which may be encountered in the Work.
- C. CONTRACTOR shall draw its own conclusions as to the general accuracy of the "technical data" contained in such reports and drawings, and confirms such reports and drawings are not Contract Documents. CONTRACTOR may not rely upon or make any Claim against OWNER, ENGINEER or any of ENGINEER's Consultants with respect to:
 - a. the completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by CONTRACTOR and safety precautions and programs incident thereto, or
 - b. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings, or
 - c. any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such data, interpretations, opinions or information.
2. The cost of all the following will be included in the Contract Price and CONTRACTOR shall have full responsibility for:
 - a. reviewing and checking all such information and data,
 - b. locating all Utilities during construction,

- c. coordination of the Work with the owners of such Utilities, and
- d. the safety and protection of all such Utilities as provided in paragraph 6.15 and repairing any damage thereto resulting from the Work.

4.03 Unforeseen Physical Conditions

- A. A. If CONTRACTOR discovers one or both of the following physical conditions of surface or subsurface at the Project or improvement Site, before disturbing the physical condition, the CONTRACTOR shall immediately notify OWNER and ENGINEER of the physical condition; and follow up within 48 hours in writing:
 - 1. A subsurface or a physical condition at the Site differing materially from those indicated in the Contract Documents, or
 - 2. An unknown physical condition at the Site of a nature differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for the improvement project.
- B. ENGINEER's Review. After receipt of written notice as required by the preceding paragraph, ENGINEER will promptly review the subsurface or physical condition in question; determine the necessity of OWNER's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in paragraph 4.03.A above; obtain any pertinent cost or schedule information from CONTRACTOR; prepare recommendations to OWNER regarding 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. Possible Price and Times Adjustments.
 - 1. CONTRACTOR shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in CONTRACTOR's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must fall within any one or more of the categories described in paragraph 4.03.A;
 - b. with respect to Work that is paid for on a Unit Price basis, any adjustment in Contract Price will be subject to the provisions of paragraph 12.03; and

- c. CONTRACTOR's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to CONTRACTOR's ability to complete the Work within the Contract Times pursuant to paragraph 10.05.
2. CONTRACTOR shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. CONTRACTOR knew of the existence of such condition at the time CONTRACTOR made a commitment to OWNER with respect to Contract Price and Contract times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
 - b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for CONTRACTOR prior to CONTRACTOR's making such commitment; or
 - c. CONTRACTOR failed to give the written notice as required by paragraph 4.03.A.
3. If OWNER and CONTRACTOR agree regarding CONTRACTOR's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order or Work Change Directive.
4. CONTRACTOR may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after OWNER's issuance of the OWNER's written statement to CONTRACTOR regarding the subsurface or physical condition in question.

4.04 Utilities

- A. CONTRACTOR's Responsibilities. The information and data shown or indicated in the Contract Documents with respect to existing Utilities at or adjacent to the Site, if any, is based on information and data furnished to OWNER or ENGINEER by the owners of such Utilities, including OWNER, or by others.
 1. OWNER and ENGINEER do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and
 2. the cost of all of the following will be included in the Contract Price, and CONTRACTOR shall have full responsibility for:
 - a. reviewing and checking all information and data regarding existing Utilities at the Site;
 - b. locating all Utilities shown or indicated in the Contract Documents as being at the Site;
 - c. coordination of the Work with the owners (including OWNER) of such Utilities, during construction; and

- d. the safety and protection of all existing Utilities at the Site, and repairing any damage thereto resulting from the Work.
- B. Notice by CONTRACTOR. If CONTRACTOR believes that an Utilities that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by paragraph 6.18), identify the owner of such Underground Facility and give written notice to that owner and to OWNER and ENGINEER.
- C. ENGINEER's Review. ENGINEER will:
1. promptly review the Utilities and conclude whether such Utilities was not shown or indicated in the Contract Documents,
 2. or was not shown or indicated with reasonable accuracy;
 3. obtain any pertinent cost or schedule information from CONTRACTOR;
 4. prepare recommendations to OWNER regarding the CONTRACTOR's resumption of Work in connection with the Utilities in question;
 5. determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Utilities;
 6. and advise OWNER in writing of ENGINEER's findings, conclusions, and recommendations.

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

- D. OWNER's Statement to CONTRACTOR Regarding Utilities. After receipt of ENGINEER's written findings, conclusions, and recommendations, OWNER shall issue a written statement to CONTRACTOR (with a copy to ENGINEER) regarding the Utilities in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting ENGINEER's written findings, conclusions, and recommendations in whole or in part.
- E. Possible Price and Times Adjustments:
1. CONTRACTOR shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Utilities at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in CONTRACTOR's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. CONTRACTOR did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Utilities in question;
 - b. With respect to Work that is paid for on a Unit Price basis, any adjustment in Contract Price will be subject to the provisions of paragraph 12.03;

- c. CONTRACTOR's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to CONTRACTOR's ability to complete the Work within the Contract Times; and
 - d. CONTRACTOR gave the notice required in paragraph 4.04.B.
- 2. If OWNER and CONTRACTOR agree regarding CONTRACTOR's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
 - 3. CONTRACTOR may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after OWNER's issuance of the OWNER's written statement to CONTRACTOR regarding the Underground Facility in question.

4.05 Reference Points

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

4.06 Constituents of Concern

- A. OWNER shall be responsible for any Constituents of Concern uncovered or revealed at the Site which was not shown or indicated in Plans or Specifications or identified in the Contract Documents to be within the scope of the Work and which may present a substantial danger to persons or property exposed thereto in connection with the Work at the Site. OWNER shall not be responsible for any such materials brought to the Site by CONTRACTOR, Subcontractor, Suppliers or anyone else for whom CONTRACTOR is responsible.
- B. Upon discovering any such material, CONTRACTOR shall immediately:
 - 1. stop all Work in connection with such Hazardous Environmental Condition and in any area affected thereby (except in emergency as required by paragraph 6.18), and
 - 2. notify OWNER and ENGINEER (and thereafter confirm such notice in writing). OWNER shall promptly consult with ENGINEER concerning the necessity for OWNER to retain a qualified expert to evaluate such Hazardous Environmental Condition or take corrective action, if any.
- C. CONTRACTOR shall not be required to resume Work in connection with such Hazardous Environmental Condition or in any such affected areas until after OWNER has obtained any required permits related thereto and delivered to CONTRACTOR special written notice:

1. specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or
 2. specifying any special conditions under which such Work may be resumed safely.
- D. If OWNER and CONTRACTOR cannot agree as to entitlement to, or the amount, or extent of an adjustment, if any, in Contract Price or Contract Terms as a result of such Work stoppage or such special conditions under which Work is agreed by CONTRACTOR to be resumed, either party may make a Claim therefor as provided in paragraph 11.01.
- E. If after receipt of such special written notice CONTRACTOR does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then OWNER may order such portion of the Work that is in connection with such condition, or in such affected area, to be deleted from the Work. If OWNER and CONTRACTOR cannot agree as to entitlement to, or the amount, or extent of an adjustment, if any, in Contract Price or Contract Time as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in paragraph 11.01. OWNER may have such deleted portion of the Work performed by OWNER's own forces or others in accordance with paragraph 7.01.
- F. To the fullest extent permitted by Laws and Regulations, OWNER shall indemnify and hold harmless CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and the officers, directors, employees, agents, other consultants and subcontractors of each and any of them from and against all claims, costs, losses, damages and expenses arising out of or resulting from such condition per this paragraph 4.06, provided that:
1. any such claim, cost, loss or damage is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, and
 2. nothing in this paragraph 4.06 shall obligate OWNER to indemnify any person or entity from and against the consequences of that person's or entity's own negligence.
- G. The provisions of paragraph 4.03 are not intended to apply to the presence of Constituents of Concern or Hazardous Environmental Conditions uncovered or revealed at the Site.

Article 5 Bonds and Insurance

5.01 Performance and Other Bonds

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

1. are licensed to conduct business in the state where the Project is located, and
 2. are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the U.S. Department of Treasury, Financial Management Service, Surety Bond Branch.
- C. All Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.
- D. If Surety on any Bond furnished by CONTRACTOR is declared as bankrupt or becomes insolvent, or its right to do business is terminated in any state where any part of the Project is located, or it ceases to meet the requirements of clauses (1) and (2) of paragraph 5.01, CONTRACTOR shall within 5 days thereafter substitute another Bond and Surety, both of which shall be acceptable to OWNER.

5.02 Licensed Insurers and Sureties

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

5.03 Insurance

- A. CONTRACTOR shall purchase and maintain during the term of the Project such insurance as will protect him, OWNER(s) and ENGINEER(s) from Claims arising out of the Work described in this Contract and performed by CONTRACTOR, Subcontractor(s) or Sub subcontractor(s) consisting of:
1. Workers' Compensation Insurance including Employer's Liability to cover employee injuries or disease compensable under the Workers' Compensation Statutes of the states in which Work is conducted under this Contract; disability benefit laws, if any; or Federal compensation acts such as U.S. Longshoremen or Harbor Workers', Maritime Employment, or Railroad Compensation Act(s), if applicable. Self-insurance plans approved by the regulatory authorities in the state in which Work on this Project is performed are acceptable.
 2. An occurrence form Commercial General Liability policy to cover bodily injury to persons other than employees and for damage to tangible property, including loss of use thereof, plus appropriate endorsements to protect OWNER and ENGINEER against Claims, demands, and lawsuits from employees of CONTRACTOR and Subcontractors, including the following exposures:
 - a. All premises and operations.
 - b. Explosion, collapse and underground damage.
 - c. CONTRACTOR's Protective coverage for independent contractors or Subcontractors employed by him.

- d. Broad form blanket, contractual liability for the obligation assumed in the Indemnification or Hold Harmless agreement found in the General Conditions or Supplementary Conditions of this Contract.
 - e. Personal Injury Liability endorsement with no exclusions pertaining to employment.
 - f. Products and Completed Operations coverage. Coverage shall extend through the Contract guarantee period.
 - g. Broad form property damage.
 - h. Cross liability endorsement.
 - i. For design professional additional insureds, ISO Endorsement CG 20 32 04 13, "Additional Insured-Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.
3. Comprehensive Automobile Liability policy to cover bodily injury and property damage arising out of the ownership, maintenance or use of any motor vehicle, including owned, non-owned and hired vehicles. Comprehensive General Liability and the Comprehensive Auto Liability shall be written by the same insurance carrier, though not necessarily in one policy.
 4. CONTRACTOR shall purchase for OWNER an Owner's Protective Liability policy to protect OWNER, ENGINEER, their consultants, agents, employees and such public corporations in whose jurisdiction the Work is located for their liability for Work performed by the CONTRACTOR, the Subcontractor(s) or the Sub subcontractor(s) under this Contract.
 5. When a limit of liability is identified in the Supplementary Conditions, CONTRACTOR shall purchase a Builder's Risk Installation Floater in a form acceptable to OWNER covering property of the Project for the full cost of replacement as of the time of any loss which shall include, as named insureds,
 - a. CONTRACTOR,
 - b. all Subcontractors,
 - c. all Sub subcontractors,
 - d. OWNER, and ENGINEER(s) or Architect(s), as their respective interests may prove to be at the time of loss, covering insurable property which is the subject of this Contract, whether in place, stored at the Site, stored elsewhere, or in transit at the risk of the insured(s).

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

6. Umbrella or Excess Liability

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

7. Railroad Protective Liability

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

8. CONTRACTOR's Professional Liability Insurance

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

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

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

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

5.04 Limits of Liability

- A. The required limits of liability for insurance coverages required in paragraphs 5.03 shall be not less than those specified in the Supplementary Conditions.

5.05 Notice of Cancellation or Intent Not to Renew

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

5.06 Evidence of Coverage

- A. Prior to commencement of the Work, CONTRACTOR shall furnish to OWNER and ENGINEER, Certificates of Insurance in force on current Accord® Certificate of Insurance form. Other forms of Certificate are acceptable only if;
 - 1. they include all of the items prescribed in the current Accord® Certificate of Insurance form, including agreement to cancellation provisions outlined in paragraph 5.05 above; and
 - 2. they have approval of OWNER and ENGINEER.
- B. Prior to the commencement of the Work, CONTRACTOR shall furnish to OWNER complete "originally signed" copies of the Owner's Protective Liability Policy. The number of copies shall be the same as the number of counterparts of the Agreement. OWNER reserves the right to request complete copies of other policies if deemed necessary to ascertain details of coverage not provided by the certificates. Such policy copies shall be "Originally Signed Copies," and so designated.

5.07 Qualification of Insurers

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

5.08 Damage Claims - Acknowledgment and Reports

- A. CONTRACTOR shall furnish to OWNER an acknowledgment receipt from the insurance carrier for each damage claim against the Project. The receipt shall include the insurance carrier's assigned claim number.
- B. Upon request, CONTRACTOR or his insurance carrier shall also furnish to OWNER a status report on all damage claims. This report shall include inspections made, the disposition of claims, and what action has been taken towards settlement of each claim.
- C. Failure of CONTRACTOR to comply with this paragraph 5.08 may result in the amount of such damage claims being withheld from CONTRACTOR's monthly pay estimate. Such withholding shall be reimbursed in the monthly pay estimate following compliance with this paragraph.

5.09 Cost of Insurance

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

5.10 Waiver of Rights

- A. OWNER and CONTRACTOR intend that all policies purchased in accordance with paragraph 5.03 will protect OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants (and all other persons or entities identified in the Supplementary General Conditions to be listed as insureds or additional insureds in such policies) and will provide primary coverage for all losses and damages caused by the perils covered thereby. Such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder.
- B. OWNER and CONTRACTOR waive all rights against each other and their respective officers, directors, employees and agents for all losses and damages caused by, arising out of or resulting from any of the perils covered by such policies and any other property insurance applicable to the Work; and in addition, waive all such rights against Subcontractors, ENGINEER, ENGINEER's Consultants and any other persons or entities identified in the Supplementary General Conditions to be listed as insureds or additional insureds under such policies for loss and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by OWNER as trustee or otherwise payable under any policy so issued.

5.11 Receipt and Application of Insurance Proceeds

- A. Any insured loss under the policies of insurance required by paragraph 5.03.A.5 will be adjusted with OWNER and made payable to OWNER as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause. If no other special agreement is reached the damaged Work shall be repaired or replaced, the monies so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order, Field Order or Work Change Directive.
- B. OWNER as fiduciary shall have power to adjust and settle any loss under the policies required by paragraph 5.03.A.5 with the insurers unless one of the parties in interest shall object in writing within fifteen days after the occurrence of loss to OWNER's exercise of this power. If such objection be made, OWNER as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, OWNER as fiduciary shall adjust and settle the loss with the insurers.

Article 6 CONTRACTOR's Responsibilities

6.01 Supervision and Superintendence

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

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

6.02 Labor and Working Hours

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

6.03 Services, Materials and Equipment

- A. Unless otherwise specified in the Contract Documents, CONTRACTOR shall furnish and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start up and completion of the Work.
- B. All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Contract Documents shall expressly run to the benefit of OWNER. If required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence, (including reports of required tests) as to the kind and quality of materials and equipment to be incorporated in the Work. The CONTRACTOR shall not use material in the Work until Shop Drawing or Submittals have been reviewed by the ENGINEER. All materials which do not meet the requirements of the Specifications at the time they are to be used will be rejected, and unless otherwise permitted by ENGINEER, shall be plainly marked and removed immediately from the Work.
- C. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable manufacturer, fabricator, Supplier or distributor, except as otherwise provided in the Contract Documents.

6.04 Substitutes and "Or-Equals"

- A. Whenever an item of materials or equipment is specified or described in the Contract Documents for installation in the Work by using the name of a proprietary item or the name of a particular manufacturer, fabricator, supplier or distributor; or means, methods, techniques, sequences and procedures of construction are prescribed in the Plans or Specifications; the specification or description is intended to establish the type, function and quality required or the means, methods, techniques, sequences and procedures of construction required. Unless the specification or description contains or is followed by words indicating that no like, equivalent or "or-equal" item or no substitution is permitted, other items of material or equipment or materials or equipment of other manufacturers, fabricators, suppliers or distributors; or other means, methods, techniques, sequences and procedures of construction may be accepted by ENGINEER under the following circumstances:
1. "Or-Equal": If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by ENGINEER as an "or-equal" item, in which case review and approval of the proposed item may, in ENGINEER's sole discretion, be accomplished without compliance with some or all of the requirements for acceptance of proposed substitute items.
 2. Substitute Items: If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR does not qualify as an "or-equal" item under paragraph 6.04.A; or a proposed means, methods, techniques, sequences and procedures of construction are different from what is prescribed in the Plans or Specifications, it will be considered a proposed substitute item.
- B. CONTRACTOR shall submit sufficient information as provided below to allow ENGINEER to determine that the item of material or equipment or means, methods, techniques, sequences and/or procedures proposed is essentially equivalent to that named and an acceptable substitute therefor. The procedure for review by the ENGINEER will include the following, as supplemented in the Specifications, and as ENGINEER may decide is appropriate under the circumstances. Requests for review of substitute items of material and equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR.
- C. If CONTRACTOR wishes to furnish or use a substitute, CONTRACTOR shall make written application to ENGINEER on the Substitution Request Form provided for acceptance thereof, certifying that the proposed substitute will:
1. perform adequately the functions and achieve the results called for by the general design,
 2. be similar in substance to that specified,
 3. and be suited to the same use and capable of performing the same function as that specified.

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

- D. All variations of the proposed substitute from that specified shall be identified in the application and available maintenance, repair and replacement service shall be indicated. The application shall also contain an itemized estimate of all costs or credits that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which shall be considered by ENGINEER in evaluating the proposed substitute. ENGINEER may require CONTRACTOR to furnish additional data about the proposed substitute.
- E. All data to be provided by CONTRACTOR in support of any proposed "or-equal" or substitute item will be at CONTRACTOR's expense. ENGINEER will be the sole judge of acceptability, and ENGINEER's determination shall be final and binding, may not be reversed through an appeal under any provisions of the Contract Documents, and no "or-equal" or substitute shall be ordered, installed or utilized without ENGINEER's prior written acceptance. OWNER may require CONTRACTOR to furnish at CONTRACTOR's expense a special performance guarantee or other surety with respect to any "or-equal" or substitute which has been approved by ENGINEER.
- F. ENGINEER will record time required by ENGINEER and ENGINEER's consultants in evaluating substitutions proposed by CONTRACTOR and in making changes in the Contract Documents occasioned thereby. Whether or not ENGINEER accepts a proposed substitute, CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and ENGINEER's consultants for evaluating any proposed substitute and in making any changes in the Contract Documents resulting therefrom.

6.05 Concerning Subcontractors

- A. CONTRACTOR shall not employ any Subcontractor, Supplier or other person or organizations, including those who are to furnish the principal items of materials or equipment, whether initially or as a substitute, against whom OWNER or ENGINEER may have reasonable objection. CONTRACTOR shall furnish ENGINEER a complete list of any Subcontractor, Supplier or other person or organization furnishing principal items of material or equipment within 4 days of request. Failure to object to any Subcontractor, Supplier, other person or organization by OWNER or ENGINEER shall not constitute a waiver of any right of OWNER or ENGINEER to reject defective Work.
- B. If OWNER or ENGINEER, after due investigation, has reasonable objection to any Subcontractor, Supplier, other person or organization proposed by CONTRACTOR after the Notice of Award, CONTRACTOR shall submit an acceptable substitute and the Contract Price shall be increased or decreased by the difference in cost occasioned by such substitution, and an appropriate Change Order shall be issued. CONTRACTOR shall not be required to employ any Subcontractor, Supplier, other person or organization against whom CONTRACTOR has reasonable objection.

- C. The CONTRACTOR shall not award Work to Subcontractor(s), in excess of 50% of the Contract Price, without prior written approval of the OWNER.
- D. CONTRACTOR shall be fully responsible for all acts and omissions of his Subcontractors, Suppliers and of persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR just as CONTRACTOR is responsible for CONTRACTOR's own acts and omissions. Nothing in the Contract Documents shall create for the benefit of any such Subcontractor, Supplier or other person or organization any contractual relationship between OWNER or ENGINEER and any such Subcontractor, Supplier or other person or organization, nor shall it create any obligation on the part of OWNER or ENGINEER to pay or to see to the payment of any moneys due any Subcontractor, Supplier or other person or organization. OWNER or ENGINEER may furnish to any Subcontractor, Supplier or other person or organization, to the extent practicable, evidence of amounts paid to CONTRACTOR on account of specific Work done.
- E. The CONTRACTOR shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR. CONTRACTOR shall require all Subcontractors, Suppliers and such other persons and organizations performing or furnishing any of the Work to communicate with the ENGINEER through CONTRACTOR.
- F. If the amount of the subcontract or the nature of the Work to be performed thereunder warrants, OWNER may require Subcontractor to furnish, for the benefit of the OWNER and CONTRACTOR jointly, Bonds in an amount proportioned to the amount of his subcontract, and for the same purpose and under the same specifications as those of the general Contract. The Surety on the general Contract shall not be eligible to furnish such Subcontract Bonds.
- G. All Work performed for CONTRACTOR by a Subcontractor or Supplier will be pursuant to an appropriate agreement between CONTRACTOR and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of OWNER and ENGINEER. Whenever any such agreement is with a Subcontractor or Supplier who is listed as and additional insured on the property insurance provided in paragraph 5.03.A.5, the agreement between the CONTRACTOR and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against OWNER, CONTRACTOR, ENGINEER, ENGINEER's Consultants and all other additional insureds for all losses and damages caused by, arising out of or resulting from any of the perils covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, CONTRACTOR will obtain the same. CONTRACTOR shall file a true copy of such agreement with OWNER.

6.06 Patent Fees and Royalties

- A. CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of OWNER or ENGINEER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by OWNER in Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall defend, indemnify and hold harmless OWNER and ENGINEER and anyone directly or indirectly employed by either of them from and against all claims, costs, losses, damages and expenses arising out of or resulting from any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product or device not specified in the Contract Documents, and shall defend all such claims in connection with any alleged infringement of such rights.

6.07 Permits and Licenses

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

6.08 Laws and Regulations

- A. CONTRACTOR shall give all notices and comply with all laws, ordinances, rules, and regulations applicable to furnishing and performance of the Work. Neither OWNER nor ENGINEER shall be responsible for monitoring CONTRACTOR's compliance with any Laws, ordinances, rules, and Regulations.
- B. If CONTRACTOR performs any Work that is contrary to such laws, ordinances, rules and regulations, CONTRACTOR shall bear all claims, costs, losses, damages and expenses caused by, arising out of, or resulting therefrom. However, it shall not be CONTRACTOR's primary responsibility to make certain that the Specifications and Plans are in accordance with such laws, ordinances, rules, and regulations, but this shall not relieve CONTRACTOR of CONTRACTOR's obligations under paragraph 3.03.
- C. OWNER or CONTRACTOR may give notice to the other party of any changes after the submission of CONTRACTOR's Bid (or after the date when CONTRACTOR became bound under a negotiated Contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If OWNER and CONTRACTOR are unable to agree on entitlement to, or on the amount, or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice CONTRACTOR may submit a Change Proposal, or OWNER may initiate a Claim.

6.09 Taxes

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

6.10 Use of Premises

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

6.11 Removal of Debris and Cleaning

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

6.12 Loading Structures

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

6.13 Protection of Utilities

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

6.14 Record Documents

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

6.15 Safety and Protection

- A. CONTRACTOR shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
 - 1. all persons on the Work Site or who may be affected by the Work,
 - 2. all the Work and materials or equipment to be incorporated therein, whether in storage on or off the Site, and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and Utilities and not designated for removal, relocation or replacement in the course of construction.
- B. CONTRACTOR shall comply with all applicable Laws and Regulations and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. CONTRACTOR shall notify owners of adjacent property, Utilities, and utility owners when prosecution of the Work may affect them.
- C. CONTRACTOR shall restore, at his own expense, any public or private property damaged or injured in consequence of any act or omission on his part, or on the part of his employees or agents, to a condition equal or better than that existing before such injury or damage was done. If CONTRACTOR neglects to restore or make good such damages or injury, OWNER may, upon 48 hours' notice, proceed to restore or make good such damage or injury and to order the cost thereof deducted from any monies that are due, or may become due, to CONTRACTOR for this Work.
- D. CONTRACTOR's duties and responsibilities for the safety and protection of the Work shall continue until such time as all the Work is completed and ENGINEER has issued a notice to OWNER and CONTRACTOR in accordance with paragraph 14.11 that the Work is Acceptable.
- E. CONTRACTOR shall comply with the applicable requirements of OWNER's safety programs, if any. Any OWNER's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.
- F. CONTRACTOR shall inform OWNER and ENGINEER of the specific requirements of CONTRACTOR's safety program with which OWNER's and ENGINEER's employees and representatives must comply while at the Site.

- G. CONTRACTOR's duties and responsibilities for safety and protection will continue until all the Work is completed, ENGINEER has issued a written notice to OWNER and CONTRACTOR in accordance with paragraph 14.11 that the Work is acceptable, and CONTRACTOR has left the Site (except as otherwise expressly provided in connection with Substantial Completion).
- H. CONTRACTOR's duties and responsibilities for safety and protection will resume whenever CONTRACTOR or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

6.16 Safety Representative

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

6.17 Hazard Communication Program

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

6.18 Emergencies

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

6.19 Shop Drawings and Samples

- A. CONTRACTOR shall submit Shop Drawings required by the Contract Documents to ENGINEER for review, in accordance with an accepted schedule. All Submittals will be identified as ENGINEER may require and in the number of copies specified in the Specifications. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to show ENGINEER the materials and equipment CONTRACTOR proposes to provide and to enable ENGINEER to review the information for the limited purposes required by paragraph 6.21.
- B. CONTRACTOR shall also submit all samples required by the Contract Documents to ENGINEER for review in accordance with an accepted schedule. Each Sample will be identified clearly as to material, Supplier, pertinent data such as catalog numbers, the use for which intended, and other data as ENGINEER may require to enable ENGINEER to review the Submittal for the limited purposes required by paragraph 6.21. The number of each sample to be submitted will be as specified in the Specifications.

6.20 Submittal Procedures

- A. Before submitting each Shop Drawing or Sample, CONTRACTOR shall have determined and verified:
 - 1. all field measurements, quantities, dimension, specified performance criteria, installation requirements, manufacturer's recommendations, material, catalog numbers and similar information with respect thereto,
 - 2. all materials with respect to intended use, fabrication, shipping, handling, storage, assembly and installation pertaining to the performance of the Work, and
 - 3. all information relative to CONTRACTOR's responsibilities in respect of means, methods, techniques, sequences and procedures of construction and safety precautions and programs incident thereto.
- B. CONTRACTOR shall have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.
- C. Each Submittal will bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's obligations under the Contract Documents with respect to review and approval of that Submittal.
- D. At the time of each submission, CONTRACTOR shall in writing call ENGINEER's attention to any deviations that the Shop Drawings or Samples may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawing's or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to ENGINEER for review of each such variation.
- E. CONTRACTOR shall make corrections required by ENGINEER and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review. CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by ENGINEER on previous Submittals.
- F. CONTRACTOR shall furnish required Submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. ENGINEER will record ENGINEER's time for reviewing a fourth or subsequent submittal of Shop Drawings, sample, or other item requiring approval, and CONTRACTOR shall be responsible for ENGINEER's charges to OWNER for such time. OWNER may impose a set-off against payments due to CONTRACTOR to secure reimbursement for such charges.
- G. If CONTRACTOR requests a change of a previously approved Submittal item, CONTRACTOR shall be responsible for ENGINEER's charges to OWNER for its review time, and OWNER may impose a set-off against payments due to CONTRACTOR to secure reimbursement for such charges, unless the need for such change is beyond the control of CONTRACTOR.

6.21 ENGINEER's Review

- A. ENGINEER will review Shop Drawings and Samples in accordance with the Schedule of Submittals accepted by ENGINEER as required by paragraph 2.05. ENGINEER's review shall be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and shall not extend to means, methods, sequences, techniques or procedures of construction or to safety precautions or programs incident thereto. The review of a separate item as such will not indicate review of the assembly in which the item functions.
- B. ENGINEER's review of Shop Drawings or samples shall not relieve CONTRACTOR from responsibility for any variations from the Contract Documents unless CONTRACTOR has in writing called ENGINEER's attention to such variation at the time of submission and ENGINEER has given written concurrence to the specific variation, nor shall any concurrence by ENGINEER relieve CONTRACTOR from responsibility for errors or omissions in the Shop Drawings. ENGINEER's review shall not relieve CONTRACTOR from responsibility for complying with the requirements of paragraph 6.20.
- C. Where a Shop Drawing or sample is required by the Contract Documents or the Schedule of Submittals accepted by ENGINEER per paragraph 2.05, no related Work shall be commenced until the Submittal has been reviewed by the ENGINEER.

6.22 Continuing the Work

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

6.23 CONTRACTOR's General Warranty and Guarantee

- A. CONTRACTOR warrants and guarantees to OWNER, ENGINEER, and ENGINEER's Consultants that all work will be in accordance with the Contract Documents and will not be defective. CONTRACTOR's warranty and guarantee excludes defects or damage caused by:
 - 1. abuse, modification, or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors, Suppliers, or their employees, agents, or representatives, or any person or entity for whom CONTRACTOR is responsible; or
 - 2. normal wear and tear under normal usage.
- B. CONTRACTOR's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents:
 - 1. observations by ENGINEER;
 - 2. recommendation of any progress or final payment by ENGINEER;
 - 3. the issuance of a certificate of Substantial Completion or any payment by OWNER to CONTRACTOR under the Contract Documents;
 - 4. use or occupancy of any part of the Work by OWNER;
 - 5. any acceptance by OWNER or failure to do so;

6. any review or approval of a Shop Drawing or Sample Submittal or the issuance of a notice of acceptability by ENGINEER per paragraph 14.11;
 7. any inspection, test or approval by others; or
 8. any correction of defective Work by OWNER.
- C. If Contract requires 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 shall govern with respect to CONTRACTOR's performance obligations to OWNER for the Work described in the assigned Contract.
- D. CONTRACTOR shall assign to OWNER all warranties extended to CONTRACTOR by material Suppliers and Subcontractors. If an assignment of warranty requires the material Supplier or Subcontractor to consent to same, then CONTRACTOR shall secure the material Supplier's or Subcontractor's consent to assign said warranties to OWNER.
- E. The warranties provided in this section shall be in addition to, and not in limitation of, any other warranty or remedy required by law.

6.24 Indemnification

- A. To the fullest extent permitted by law, CONTRACTOR shall indemnify, defend (with counsel acceptable to OWNER) and hold harmless OWNER, ENGINEER and any additional indemnitees identified in the Supplementary Conditions and their respective directors, officers, members, partners, affiliates, employees, agents and successors, from and against any and all liabilities, claims, causes of action, lawsuits, liens, injuries, damages, losses and expenses (collectively "Demands") to the extent caused by, arising out of, resulting from or occurring in connection with:
1. CONTRACTOR's breach of, or failure to comply with, the Agreement, the Contract Documents, or any other contract that it enters into regarding the Work, including any default in performance; or
 2. Personal injury or death to any person (including, but not limited to, CONTRACTOR, CONTRACTOR's employees, Subcontractors, Subcontractors' employees, and material Suppliers) or injury to or destruction of property (including claims for loss of use) caused by, arising out of, resulting from, or in any way connected with
 - a. the Work,
 - b. any activity associated with the Work, or
 - c. the operations or acts of commission or omission of CONTRACTOR, CONTRACTOR's employees, Subcontractors, Subcontractors' employees, material suppliers, or anyone for whom CONTRACTOR is legally liable in the performance of Work, whether arising before or after completion of the Work.
- B. To the extent caused by, arising out of, resulting from, or occurring in connection with the provisions of the above paragraph 6.24.A, CONTRACTOR's indemnity obligations under this Agreement shall include, but are not limited to:

1. Indemnity for all damages and judgment interest, all costs and fees, including, but not limited to, all defense costs, expenses and actual attorneys' fees, and all settlement payments relating to, arising out of, resulting from or in any way connected with any demand requiring indemnity by this Agreement;
 2. All expenses, including but not limited to, costs, expenses and actual attorneys' fees, incurred in securing and enforcing indemnity from CONTRACTOR if CONTRACTOR fails or refuses promptly to fulfill any of the indemnity obligations under this Agreement;
 3. All indemnification obligations imposed upon OWNER or ENGINEER, or both, arising out of or in connection with the Work; and
 4. Indemnification for any penalties and/or fines arising or resulting from CONTRACTOR's or any SUBCONTRACTOR's failure to comply with laws and/or regulations applicable to its/their Work.
- C. Contractor's duty to indemnify under Subpart A.2. of Article 6.24 is limited to the negligence of Contractor, Contractor's employees, Subcontractors, Subcontractor's employees, material Suppliers, or anyone for whom Contractor is legally liable in the performance of the Work, whether arising before or after the completion of the Work.
- D. The indemnification rights under this Agreement shall not be construed to negate, abridge, or otherwise reduce any other right or obligations of indemnity which would otherwise exist.
- E. OWNER, at its option, may select counsel to defend any demand brought against it without impairing any obligation of the CONTRACTOR to provide indemnification.
- F. The indemnification provisions under this Agreement shall survive the completion or termination of this Agreement.
- G. In the case of claims by any employee of CONTRACTOR, anyone directly or indirectly employed by CONTRACTOR, or anyone for whose acts CONTRACTOR may be liable, the indemnification obligations under this Agreement shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for CONTRACTOR under workers' compensation acts. Such obligations shall not be construed to negate, abridge or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Agreement.
- H. Indemnification, additional insured and hold harmless obligations of CONTRACTOR and Subcontractor under the Contract Documents shall survive the termination of this Agreement.
- I. CONTRACTOR and Subcontractors will compel their insurance company to waive subrogation against OWNER, all ENGINEERS and all CONTRACTORS and Subcontractors identified as additional insureds in the Contract Documents, including any municipal entity now existing or newly created during the term of the Contract Documents.

6.25 Delegation of Professional Design Services

- A. CONTRACTOR will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out CONTRACTOR's responsibilities for construction means, methods, techniques, sequences or procedures. CONTRACTOR shall not be required to provide professional services in violation of applicable Laws and Regulations.
- B. If professional design services or certifications by a design professional related to systems, materials, equipment, structures, means, methods, techniques or sequences of construction are specifically required of CONTRACTOR by the Contract Documents, OWNER and ENGINEER will specify all performance and design criteria that such services must satisfy. CONTRACTOR shall cause such services or certifications to be provided by a professional properly licensed in the state in which the project is located, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other Submittals prepared by such professional. Shop Drawings and other Submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to ENGINEER.
- C. OWNER and ENGINEER shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals.
- D. Pursuant to this paragraph 6.25, ENGINEER's review or approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. ENGINEER's review or approval of Shop Drawings and other Submittals (except design calculations and design drawings) will be only for the purpose stated in paragraph 6.21.
- E. CONTRACTOR shall not be responsible for the adequacy of the performance or design criteria specified by OWNER or ENGINEER.

Article 7 Work by Others

7.01 Related Work at Site

- A. In addition to and apart from the Work under the Contract Documents, 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 any part of CONTRACTOR's Work depends on proper execution or results upon the work of any such other contractor or utility owner, CONTRACTOR shall inspect and promptly report to ENGINEER in writing any delays, defects or deficiencies in such other work that render it unavailable, or unsuitable for such proper execution and results of CONTRACTOR's Work. CONTRACTOR's failure to so report shall constitute an acceptance of the other work as fit and proper for integration with CONTRACTOR's Work except for latent or non-apparent defects and deficiencies in the other work.

- C. CONTRACTOR shall afford each contractor who is party to such a direct contract, and each utility owner, (and OWNER, if OWNER is performing the additional work with OWNER's employees), proper and safe access to the Site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work and shall properly connect and coordinate the Work with theirs. Unless otherwise provided in the Contract Documents, CONTRACTOR shall do all cutting, fitting and patching of CONTRACTOR's Work that may be required to make its several parts come together properly and integrate with such other work. CONTRACTOR shall not endanger any work of others by cutting, excavating or otherwise altering their work and will only cut or alter their work with the written consent of ENGINEER and the others whose work will be affected.
- D. If the performance of additional work by other contractors, utility owner, or OWNER was not noted in the Contract Documents, written notice thereof shall be given to CONTRACTOR prior to starting any such additional work. If CONTRACTOR believes that the performance of such additional work by OWNER or others involves additional expense to CONTRACTOR, or requires an extension of the Contract Time, CONTRACTOR may make a Claim therefor as provided in paragraph 11.01. Claims for delay or inconveniences due to operations of such other parties for work noted in the Contract Documents will not be allowed.

Article 8 OWNER's Responsibilities

8.01 Communication to CONTRACTOR

- A. Except as otherwise provided in these General Conditions, OWNER shall issue all communications to CONTRACTOR through ENGINEER.

8.02 Replacement of ENGINEER

- A. In case of termination of the employment of ENGINEER, OWNER shall appoint an engineer against whom CONTRACTOR makes no reasonable objection, whose status under the Contract Documents shall be that of the former ENGINEER.

8.03 Furnishing Data

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

8.04 Pay When Due

- A. OWNER shall make payments to CONTRACTOR promptly after they are due as provided in paragraphs 14.05 and 14.11.

8.05 Lands and Easements; Reports and Tests

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

8.06 Change Orders

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

8.07 Inspections, Tests, and Approvals

- A. OWNER'S responsibility in respect to certain inspections, tests and approvals is set forth in paragraph 13.02.

8.08 Limitation on OWNER's Responsibility

- A. 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 furnishing or performance of the Work. OWNER will not be responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents.

8.09 Undisclosed Hazardous Materials

- A. OWNER's responsibility in respect of undisclosed Constituents of Concern uncovered or revealed at the Site is set forth in paragraph 4.06.

8.10 OWNER'S Designated Representative

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

Article 9 ENGINEER's Status During Construction

9.01 OWNER's Representative

- A. ENGINEER will be OWNER's representative during the construction period. The duties and responsibilities and the limitations of authority of ENGINEER as OWNER'S representative during construction shall be as set forth in the Contract Documents.

9.02 Visits to Site

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

9.03 Resident Project Representative

- A. If OWNER and ENGINEER agree, ENGINEER will furnish a Resident Project Representative to assist ENGINEER in providing more continuous observation of the Work. A Resident Project Representative will act as directed by and under the supervision of ENGINEER and will confer with ENGINEER regarding his actions. Resident Project Representative's dealings in matters pertaining to the on Site Work shall in general be only with ENGINEER and CONTRACTOR, and dealings with Subcontractors shall only be through or with the full knowledge of CONTRACTOR. The Resident Project Representative's duties and responsibilities include:

1. Schedules
 - a. Review the Progress Schedule, Schedule of Submittals and Schedule of Values prepared by CONTRACTOR.
2. Conferences

- a. Arrange a schedule of progress meetings and other job conferences as required in consultation with ENGINEER and OWNER, and notify those expected to attend in advance.
3. Liaison
 - a. Serve as ENGINEER's liaison with CONTRACTOR, working principally through CONTRACTOR's superintendent and assist him in understanding the intent of the technical aspects of the Contract Documents. Assist ENGINEER in serving as OWNER's liaison with CONTRACTOR when CONTRACTOR's operations affect OWNER's on Site operations.
4. Shop Drawings and Samples
 - a. Advise ENGINEER and CONTRACTOR, or CONTRACTOR's superintendent, immediately of the commencement of any Work requiring a Shop Drawing or Sample submission if the submission was identified on the schedule and has not been reviewed by ENGINEER.
5. Review of Work, Rejection of Defective Work, Inspections, and Tests:
 - a. Conduct on Site observations of the Work and report to ENGINEER whenever Resident Project Representative believes that technical aspects of any executed Work is unsatisfactory, faulty or defective or does not meet the requirements of any inspections, tests or approval required to be made or has been damaged prior to final payment; and advise ENGINEER when Resident Project Representative believes that any partially completed portion of the Work should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.
 - b. Observe, record and report to ENGINEER appropriate details relative to test procedures and startups.
 - c. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Project, record the outcome of these inspections and report to ENGINEER.
6. Modifications
 - a. Consider CONTRACTOR's suggestions for modifications in Plans or Specifications and report them to ENGINEER.
7. Reports
 - a. Prepare periodic reports as required of progress of the Work and CONTRACTOR's compliance with the approved Progress Schedule and Schedule of Submittals.
8. Completion
 - a. Verify that all items on final list of items requiring completion or correction have been completed or corrected and make recommendations to ENGINEER concerning acceptance.
9. Exceptions

- a. Resident Project Representative:
 - (1) Shall not authorize any deviation from the Contract Documents or approve any substitute materials or equipment.
 - (2) Shall not approve or accept any portion of the completed Work.
 - (3) Shall not undertake any of the responsibilities of CONTRACTOR, Subcontractors or CONTRACTOR's superintendent, or expedite the Work.
 - (4) Shall not advise on or issue directions relative to any aspect of the means, methods, techniques, sequences or procedures of construction unless such is specifically called for in the Contract Documents.
 - (5) Shall not advise on or issue directions as to safety precautions and programs in connection with the Work.
 - (6) Shall not advise on or issue directions regarding CONTRACTOR's failure to comply with Laws and Regulations applicable to the furnishing or performance of the Work.

9.04 Clarifications and Interpretations

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

9.05 Authorized Variations in Work - Field Order

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

9.06 Rejecting Defective Work

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

9.07 Shop Drawings, Change Orders, and Payments

- A. ENGINEER's responsibility for Shop Drawings and samples are set forth in paragraphs 6.19 through 6.21 inclusive.
- B. ENGINEER's responsibilities as to Change Orders are set forth in Articles 10, 11, and 12.

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

9.08 Determinations for Unit Price Work

- A. ENGINEER will determine the actual quantities and classifications of Unit Price Work performed by CONTRACTOR. ENGINEER will review with CONTRACTOR 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, subject to the provisions of paragraph 10.06.

9.09 Decisions on Disagreements, Claims

- A. ENGINEER will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work performed thereunder. Claims, disputes and other matters relating to the acceptability of the Work, or the interpretation of the requirements of the Contract Documents pertaining to the execution and progress of the Work, shall be referred initially to ENGINEER in writing with a request for a formal decision in accordance with this paragraph 9.09.
- B. ENGINEER will, with reasonable promptness, render a written decision on the issue referred. If OWNER or CONTRACTOR believe that any such decision entitles them to an adjustment in the Contract Price, or Contract Times, or both, a Claim may be made under paragraph 11.01.
- C. ENGINEER's written decision on the issue referred will be final and binding on OWNER and CONTRACTOR, subject to the provisions of paragraph 11.01.
- D. In this capacity ENGINEER will not show partiality to OWNER or CONTRACTOR and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.10 Limitations on ENGINEER's Responsibilities

- A. Neither ENGINEER's authority to act under this Article 9 or elsewhere in the Contract Documents, nor any decision made by ENGINEER in good faith either to exercise or not exercise such authority, shall give rise to any duty or responsibility of ENGINEER to OWNER or CONTRACTOR, any Subcontractor, any manufacturer, fabricator, Supplier, distributor, surety, or any other person, employee, or agent of any of them.
- B. ENGINEER will not supervise, direct, control or have authority over, or be responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the Work. ENGINEER will not be responsible for CONTRACTOR's failure to perform the Work in accordance with the Contract Documents. These limitations on authority and responsibility shall also apply to ENGINEER's Consultant's, Resident Project Representative and assistants.
- C. ENGINEER will not be responsible for the acts or omissions of CONTRACTOR or of any Subcontractor, Supplier, or of any other individual or entity performing any of the Work.

- D. ENGINEER will not be responsible to CONTRACTOR or any Subcontractor, or Supplier, or to their agents or employees for injuries, damages, claims, losses, or expenses (including attorney's fees) of whatsoever kind resulting from or caused by any act or omission of ENGINEER in preparation for, arising from, relating to, or concerning the Project. Such acts or omissions include, but are not limited to, ENGINEER's negligence, tortuous conduct, errors, omissions, strict liability, breach of contract, or breach of warranty. ENGINEER makes no representations to CONTRACTOR, Subcontractors, Suppliers or their agents or employees regarding or respecting any work performed by ENGINEER in preparation for, arising from, relating to, or concerning the Project.
- E. Neither CONTRACTOR, its agents or employees, nor any Subcontractors or Suppliers or their agents or employees, are intended beneficiaries of ENGINEER's agreement with OWNER, nor are such parties intended beneficiaries of ENGINEER's duties or responsibilities arising therefrom. ENGINEER disclaims all duties to CONTRACTOR, Subcontractors, Suppliers or their agents or employees arising from, relating to, or concerning ENGINEER's involvement in the Project. OWNER and CONTRACTOR further agree to notify all CONTRACTOR's, Subcontractors or Suppliers of this disclaimer of ENGINEER's liability and require them to abide by this disclaimer.

Article 10 Amending the Contract Documents; Changes in the Work

10.01 Amending and Supplementing Contract Documents

- A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
 - 1. Change Orders:
 - a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
 - b. OWNER and CONTRACTOR may amend those terms and conditions of the Contract Documents that do not involve;
 - (1) the performance or acceptability of the Work,
 - (2) the design (as set forth in the Drawings, Specifications, or otherwise), or
 - (3) other engineering or technical matters, without the recommendation of ENGINEER. Such an amendment shall be set forth in a Change Order.
 - 2. Work Change Directives.

- a. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including paragraph 10.04 regarding change of Contract Price.
 - b. CONTRACTOR must submit any Change Proposal seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the issuance of the Work Change Directive.
 - c. OWNER must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.
3. Field Orders.
- a. ENGINEER may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on OWNER and CONTRACTOR, which shall perform the Work involved promptly.
 - b. If CONTRACTOR believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, CONTRACTOR shall submit a Change Proposal as provided herein.

10.02 OWNER-Authorized Changes in the Work

- A. Without invalidating the Contract and without notice to any surety, OWNER may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by ENGINEER's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if OWNER and CONTRACTOR have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive.
- B. Upon receipt of any such document, CONTRACTOR shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph 10.02 shall obligate CONTRACTOR to undertake work that CONTRACTOR reasonably concludes cannot be performed in a manner consistent with CONTRACTOR's safety obligations under the Contract Documents or Laws and Regulations.

10.03 Unauthorized Changes in the Work

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

10.04 Change of Contract Price

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of paragraph 10.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of paragraph 11.01.
- B. An adjustment in the Contract Price will be determined as follows:
 - 1. where the Work involved is covered by Unit Prices contained in the Contract Documents, then by application of such Unit Prices to the quantities of the items involved (subject to the provisions of paragraph 12.03); or
 - 2. where the Work involved is not covered by Unit Prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with paragraph 10.04.C.2); or
 - 3. where the Work involved is not covered by Unit Prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in paragraph 12.01) plus a CONTRACTOR's fee for overhead and profit (determined as provided in paragraph 10.04.C).
- C. CONTRACTOR's Fee: When applicable, the CONTRACTOR's fee for overhead and profit shall be determined as follows:
 - 1. a mutually acceptable fixed fee; or
 - 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under paragraph 12.01.B.1 and 12.01.B.2, the CONTRACTOR's fee shall be 15 percent;
 - b. for costs incurred under paragraph 12.01.B.3, the CONTRACTOR's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of paragraphs 10.04.C.2.a and 10.04.C.2.b is that the CONTRACTOR's fee shall be based on:
 - (1) a fee of 15 percent of the costs incurred under paragraphs 12.01.B.1 and 12.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and

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

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

- d. no fee shall be payable on the basis of costs itemized under paragraphs 12.01.B.4, 12.01.B.5, and 12.01.C;
- e. the amount of credit to be allowed by CONTRACTOR to OWNER for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in CONTRACTOR's fee by an amount equal to 5 percent of such net decrease; and
- f. when both additions and credits are involved in any one change, the adjustment in CONTRACTOR's fee shall be computed on the basis of the net change in accordance with paragraphs 10.04.C.2.a through 10.04.C.2.e, inclusive.

10.05 Change of Contract Times

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of paragraph 10.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of paragraph 11.01.
- B. An adjustment of the Contract Times shall be subject to the limitations set forth in paragraph 12.04, concerning delays in CONTRACTOR's progress.

10.06 Change Proposals

- A. CONTRACTOR shall submit a Change Proposal to ENGINEER to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by ENGINEER concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seeking other relief under the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only 1 issue, or a set of closely related issues.

1. Procedures. CONTRACTOR shall submit each Change Proposal to ENGINEER promptly (but in no event later than 5 days) after the start of the event giving rise thereto, or after such initial decision. CONTRACTOR shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any) to ENGINEER and OWNER within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which CONTRACTOR believes it is entitled as a result of said event. ENGINEER will advise OWNER regarding the Change Proposal and consider any comments or response from OWNER regarding the Change Proposal.
 2. ENGINEER's Action. ENGINEER will review each Change Proposal and, within 30 days after receipt of the CONTRACTOR's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to OWNER and CONTRACTOR. If ENGINEER does not take action on the Change Proposal within 30 days, then either OWNER or CONTRACTOR may at any time thereafter submit a letter to the other party indicating that as a result of the ENGINEER's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under paragraph 11.01.
 3. Binding Decision. ENGINEER's decision will be final and binding upon OWNER and CONTRACTOR, unless OWNER or CONTRACTOR appeals the decision by filing a Claim under paragraph 11.01.
- B. Resolution of Certain Change Proposals: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then ENGINEER will notify the parties that the ENGINEER is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and CONTRACTOR may choose to seek resolution under the terms of paragraph 11.01.

10.07 Execution of Change Orders

- A. OWNER and CONTRACTOR shall execute appropriate Change Orders covering:
1. changes in the Contract Price or Contract Times which are agreed to by the Parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
 2. changes in Contract Price resulting from an OWNER set-off, unless CONTRACTOR has duly contested such set-off;
 3. changes in the Work which are:
 - a. ordered by OWNER pursuant to paragraph 10.02,
 - b. required because of OWNER's acceptance of defective Work under paragraph 13.08 or OWNER's correction of defective Work under paragraph 13.09, or

- c. agreed to by the parties, subject to the need for ENGINEER's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and
- 4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under paragraph 10.06, or Article 16.
- B. If OWNER or CONTRACTOR refuses to execute a Change Order that is required to be executed under the terms of this paragraph 10.07, it shall be deemed to be of full force and effect, as if fully executed.

10.08 Notification to Surety

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

Article 11 Claims

11.01 Claims

- A. Claims Process: The following disputes between OWNER and CONTRACTOR shall be submitted to the Claims process set forth in this Article:
 - 1. Appeals by OWNER or CONTRACTOR of ENGINEER's decisions regarding Change Proposals;
 - 2. OWNER demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and
 - 3. Disputes that ENGINEER has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.
- B. Submittal of Claim: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 10 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the ENGINEER, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by CONTRACTOR seeking an increase in the Contract Times or Contract Price, or both, CONTRACTOR shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of CONTRACTOR's knowledge and belief the amount of time or money requested accurately reflects the full amount to which CONTRACTOR is entitled.
- C. Review and Resolution: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to ENGINEER.
- D. Mediation:

1. At any time after initiation of a Claim, OWNER and CONTRACTOR may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.
 2. If OWNER and CONTRACTOR agree to mediation, then after 60 days from such agreement, either OWNER or CONTRACTOR may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.
 3. OWNER and CONTRACTOR shall each pay one-half of the mediator's fees and costs.
- E. Partial Approval: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 16 for final resolution of disputes.
- F. Denial of Claim: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either OWNER or CONTRACTOR may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 16 for final resolution of disputes.
- G. Final and Binding Results: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

Article 12 Cost of the Work; Allowances; Unit Price Work

12.01 Cost of Work

- A. Purposes for Determination of Cost of the Work: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this paragraph 12.01 are used to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, CONTRACTOR is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. Costs Included: Except as otherwise may be agreed to in writing by OWNER, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in paragraph 12.01.C, and shall include only the following items:

1. Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work under schedules of job classifications agreed upon by OWNER and CONTRACTOR. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by OWNER.
2. Costs of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to CONTRACTOR unless OWNER deposits funds with CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to OWNER. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to OWNER, and CONTRACTOR shall make provisions so that they may be obtained.
3. Payments made by CONTRACTOR to Subcontractors for Work performed by Subcontractors. If required by OWNER, CONTRACTOR shall obtain competitive bids from Subcontractors acceptable to OWNER and CONTRACTOR and shall deliver such bids to OWNER, who will then determine, with the advice of ENGINEER, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as CONTRACTOR's Cost of the Work and fee as provided in this paragraph 12.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of CONTRACTOR.

- b. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from CONTRACTOR or others in accordance with rental agreements approved by OWNER with the advice of ENGINEER, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 - (1) The rental rate established for each piece of CONTRACTOR owned equipment, including appurtenances and attachments to the equipment, used will be determined by use of the Rental Rate Blue Book for Construction Equipment, Volume 1, 2 or 3, as applicable; the edition which is current at the time the Work was started will apply. The established rental rate will be equal to the "Monthly" rate divided by 176; modified by the rate adjustment factor and the applicable map adjustment factor, plus the "Estimated Operating Costs per Hour."
 - (2) For equipment not listed in the Rental Rate Blue Book, Volume 1, 2 or 3, the rental rate will be determined by using the rate listed for a similar piece of equipment or by proportioning a rate listed so that the capacity, size, horsepower, and age are properly considered.
 - (3) For equipment for which there are no comparables in the Rental Rate Blue Book, Volume 1, 2 or 3, the monthly rate shall be reasonable, but not more than 5 percent of the current list price, or invoice, of the equipment. The base hourly rate shall then be determined by dividing the monthly rate by 176 to which 20 percent will be added to the sum which will account for adjustments and operating costs.
- c. Sales, consumer, use, and other similar taxes related to the Work, and for which CONTRACTOR is liable, as imposed by laws and regulations.
- d. Deposits lost for causes other than negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

- e. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by CONTRACTOR in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with paragraph 5.03), provided such losses and damages have resulted from causes other than the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of OWNER. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining
 - f. The cost of utilities, fuel, and sanitary facilities at the Site.
 - g. The costs of premiums for all bonds and insurance that CONTRACTOR is required by the Contract Documents to purchase and maintain.
- C. Costs Excluded: The term Cost of the Work shall not include any of the following items:
- 1. Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, 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 12.01.B.1 or specifically covered by paragraph 12.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the CONTRACTOR's fee.
 - 2. Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the Site.
 - 3. Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.
 - 4. Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
 - 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraph 12.01.B.
- D. CONTRACTOR's Fee: When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, CONTRACTOR's fee shall be determined as set forth in paragraph 10.04.C.

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

12.02 Allowances

- A. It is understood that CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to OWNER and ENGINEER.
- B. Cash Allowances: CONTRACTOR agrees that:
 - 1. the cash allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - 2. CONTRACTOR's costs for unloading and handling of the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. Contingency Allowance: CONTRACTOR agrees that a contingency allowance, if any, is for the sole use of OWNER to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by ENGINEER to reflect actual amounts due CONTRACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

12.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Proposal.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to CONTRACTOR for Unit Price Work will be based on actual quantities.
- C. Each Unit Price will be deemed to include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item.
- D. ENGINEER will determine the actual quantities and classifications of Unit Price Work performed by CONTRACTOR. ENGINEER will review 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, subject to the provisions of the following paragraph 12.03.E.

- E. Within 30 days of ENGINEER's written decision under the preceding paragraph 12.03.D, CONTRACTOR may submit a Change Proposal, or OWNER may file a Claim, seeking and adjustment in the Contract Price if:
1. the quantity of any item of Unit Price Work performed by CONTRACTOR differs materially and significantly from the estimate quantity of such item indicated in the Proposal (in no event will any change in quantities of less than 25% be considered a material or significant change from the estimated quantities); and
 2. there is no corresponding adjustment with respect to any other item of Work.

12.04 Delays in CONTRACTOR's Progress

- A. If OWNER, ENGINEER, or anyone for whom OWNER is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then CONTRACTOR shall be entitled to request an equitable adjustment in the Contract Times and Contract Price. However, CONTRACTOR's entitlement to an adjustment of the Contract Times or Contract Price is expressly conditioned on such adjustment being essential to CONTRACTOR's ability to complete the Work within the Contract Times.
- B. CONTRACTOR shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of CONTRACTOR. Delay, disruption, and interference attributable to and within the control of a SUBCONTRACTOR or Supplier shall be deemed to be within the control of CONTRACTOR.
- C. If CONTRACTOR's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault and beyond the control of OWNER, CONTRACTOR, and those for which they are responsible, then CONTRACTOR shall be entitled to an equitable adjustment in Contract Times. CONTRACTOR's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to CONTRACTOR's ability to complete the Work within the Contract Times. Such an adjustment shall be CONTRACTOR's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include only the following:
1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 2. acts or failures to act of utility owners (other than those performing other works at or adjacent to the Site by arrangement with the OWNER, as specified in paragraph 7.01); and
 3. acts of war or terrorism.
- D. CONTRACTOR's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:
1. CONTRACTOR's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.

2. CONTRACTOR shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of CONTRACTOR. Such a concurrent delay by CONTRACTOR shall not preclude an adjustment of Contract Times to which CONTRACTOR is otherwise entitled.
 3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 10.
- E. Each CONTRACTOR request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:
1. The circumstances that form the basis for the requested adjustment;
 2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;
 3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;
 4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and
 5. The impact on Contract Price, in accordance with the provisions of Paragraph 10.04.

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 paragraphs 4.03 and 4.06.
- G. Paragraph 7.01 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.
- H. CONTRACTOR shall not be entitled to any adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of CONTRACTOR.
- I. CONTRACTOR must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 5 days of the commencement of the delaying, disrupting, or interfering event.

- J. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Time (or Milestones) due to delay beyond the control of both OWNER and CONTRACTOR, an extension of the Contract Times (or Milestones) in an amount equal to the time lost due to such delay shall be CONTRACTOR's sole and exclusive remedy for such delay. In no event shall OWNER or ENGINEER be liable to CONTRACTOR, any Subcontractor, any Supplier, or any other person or organization, or to any surety or employee or any agent of them, for damages, including but not limited to all fees and charges of ENGINEERS, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs, arising out of or resulting from:
1. delays caused by or within the control of CONTRACTOR (or Subcontractor or Supplier);
 2. delays beyond the control of both OWNER and CONTRACTOR, including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God, or acts of neglect by utility owners or other contractors performing other work;
- K. Nor shall OWNER or ENGINEER or each of them be liable to CONTRACTOR for any claims, costs, losses or damages sustained by CONTRACTOR on or in connection with any other project or anticipated project.
- L. Nothing in this paragraph 12.04 bars a change in Contract Price to compensate CONTRACTOR due to delay, interference, or disruption directly attributable to actions or inactions of OWNER or anyone for whom OWNER is responsible. Except for an adjustment to the Contract Times and Contract Price, the CONTRACTOR shall not be entitled to and hereby waives any and all damages that it may suffer by reason of such delay or for any Act of God, including but not limited lost profits, overhead, and other consequential damages.

Article 13 Tests and Inspection; Correction, Removal or Acceptance of Defective Work

13.01 Access to Work

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

13.02 Tests and Inspections

- A. CONTRACTOR shall give ENGINEER and testing agency at least 24-hour notice, unless otherwise specified, of readiness of the Work for all required inspections, tests or approvals, and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. If any Law and Regulation, code, or order of any public body having jurisdiction requires any Work or part thereof to specifically be inspected, tested or approved, CONTRACTOR shall assume full responsibility therefor, pay all costs in connection therewith and furnish ENGINEER the required certificates of inspection, testing or approval.

- C. CONTRACTOR shall also be responsible for and shall pay all costs in connection with any inspection or testing required in connection with OWNER's or ENGINEER's acceptance of a manufacturer, fabricator, Supplier or distributor of materials or equipment proposed to be incorporated in the Work, or of materials or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation in the Work.
- D. The cost of all other inspections, tests and approvals required by the Contract Documents shall be paid by OWNER unless otherwise specified.
- E. All inspections, tests or approvals other than those required by law, ordinance, rule, regulation, code or order of any public body having jurisdiction shall be performed by organizations acceptable to OWNER and CONTRACTOR or by ENGINEER if so specified.
- F. Cost of materials to be used in inspection and transportation costs shall be paid for by the CONTRACTOR.
- G. Neither observations by ENGINEER nor inspections, tests or approvals by others shall relieve CONTRACTOR from his obligations to perform the Work in accordance with the Contract Documents.

13.03 Uncovering Work

- A. If any Work that is to be tested, inspected or approved is covered without written concurrence of ENGINEER, or contrary to the written request of ENGINEER, it shall, if requested by ENGINEER, be uncovered by CONTRACTOR for ENGINEER's observation. Such uncovering shall be at CONTRACTOR's expense unless CONTRACTOR has given ENGINEER timely written notice of his intention to cover such Work and ENGINEER has not acted with reasonable promptness in response to such notice.
- B. If ENGINEER considers it necessary or advisable that covered Work be observed by ENGINEER or inspected or tested by others, CONTRACTOR, at ENGINEER's request, shall uncover, expose or otherwise make available for observation, inspection or testing as ENGINEER may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment. Except as otherwise specified in paragraph 13.04, the cost of Work shall be paid for as follows:
 - 1. If it is found that such Work is defective, CONTRACTOR shall bear all the expenses of such uncovering, exposure, observation, inspection and testing, and of satisfactory reconstruction, (including, but not limited to, fees and charges of engineers, architects, attorneys, and other professionals) and an appropriate deductive Change Order shall be issued. If the parties are unable to agree as to the amount or extent of any change in Contract Price or Contract Time, OWNER may make a Claim as provided in paragraph 11.01.
 - 2. If, however, such Work is not found to be defective, CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Time or both, directly attributable to such uncovering, exposure, observation, inspection, testing, and reconstruction. If the parties are unable to agree as to the amount or extent of any change in Contract Price or Contract Time, CONTRACTOR may make a Claim as provided in paragraph 11.01.

13.04 Defective Work

- A. CONTRACTOR's Obligation: It is CONTRACTOR's obligation to assure that the Work is not defective.
- B. ENGINEER's Authority: ENGINEER has the authority to determine whether Work is defective, and to reject defective Work.

13.05 OWNER May Stop the Work

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

13.06 Correction or Removal of Defective Work

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

13.07 Guarantee Period

- A. If within 1 year after the date of Substantial Completion (or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents), or by any specific provision of the Contract Documents, any Work is found to be defective, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instructions:
 - 1. repair defective land or areas;
 - 2. correct such defective Work;
 - 3. if the defective Work has been rejected by OWNER, remove it from the Site and replace it with Work that is not defective, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work or the work of others or other land or areas resulting therefrom.
- B. If CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, OWNER may have the defective Work corrected or the rejected Work removed and replaced, and all claims, costs, losses, damages and expenses caused by or resulting from such removal and replacement (including but not limited to all costs of repair or replacement or work of others) shall be paid by CONTRACTOR.
- C. Repair or replacements made under the guarantee shall bear an additional 1 year guarantee dated from the acceptance of repair or replacement.

13.08 Acceptance of Defective Work

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

13.09 OWNER May Correct Defective Work

- A. If CONTRACTOR fails within a reasonable time after written notice from ENGINEER to correct defective Work, or to remove and replace rejected Work as required by ENGINEER in accordance with paragraph 13.06, or if CONTRACTOR fails to perform the Work in accordance with the Contract Documents (including any requirements of the Progress Schedule), OWNER may, after 48 hours' written notice to CONTRACTOR and his Surety without prejudice to any other remedy he may have, correct and remedy any such deficiency.
- B. In exercising his rights and remedies under this paragraph 13.09, OWNER shall proceed expeditiously. To the extent necessary to complete corrective and remedial action, OWNER may exclude CONTRACTOR from all or part of the Site, take possession of all or part of the Work, and suspend CONTRACTOR's services related thereto, take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the Site and incorporate in the Work all materials and equipment stored at the Site or for which OWNER has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow OWNER, OWNER's representatives, agents and employees, OWNER's other contractors, and ENGINEER's consultants such access to the Site as may be necessary to enable OWNER to exercise his rights and remedies under this paragraph 13.09.
- C. All claims, costs, losses, damages and expenses incurred or sustained by OWNER in exercising such rights and remedies shall be charged against CONTRACTOR and a Change Order shall be issued incorporating the necessary revisions in the Contract Documents with respect to the Work. OWNER shall be entitled to an appropriate reduction in the Contract Price equivalent to such claims, costs, losses, damages and expenses including but not be limited to all costs of repair or replacement of work of others destroyed or damaged by correction, removal or replacement of CONTRACTOR's defective Work.
- D. CONTRACTOR shall not be allowed an extension of the Contract Time because of any delay in performance of the Work attributable to the exercise by OWNER of OWNER's rights under this Article 13.

Article 14 Payments to CONTRACTOR and Completion

14.01 Schedules

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

- B. The Schedule of Values shall include quantities and unit prices aggregating the Contract Price and shall subdivide the Work into component parts. Each unit cost so established shall include its proportionate share of CONTRACTOR's general operating charges such as profit, overhead, supervision, insurance, bond premiums, interest, equipment cost, depreciation and rental, contingencies, expendable tools, equipment and supplies. The total cost of the items and quantities CONTRACTOR lists in the Schedule of Values shall equal the total Contract Price established in the Proposal.
- C. The Schedule of Values shall include a complete set of detailed work sheets on bid take off and bid summary covering estimated general conditions expense (field overhead), general overhead, profit mark ups and revisions leading to the final bid amount.
- D. When the Schedule of Values is approved by the ENGINEER, it shall become part of the Agreement and shall be used as the basis for CONTRACTOR progress payments.
- E. Progress payments based upon Unit Price Work will be based upon the number of units completed.

14.02 Application for Progress Payment

- A. At least 20 days before each Application for Payment falls due (but not more often than once a month), CONTRACTOR shall submit to ENGINEER for review an Application for Payment, Contractor's Declaration, Payment Schedule, and updated Progress Schedules indicating the anticipated completion dates of the various stages of the Work and estimated payments during the next 3 months. Contractor's Application for Payment shall be filled out on the form provided in the Contract Documents and signed by CONTRACTOR covering the Work completed as of the date of the Application for Payment and accompanied by such supporting documentation as is required by the Contract Documents and as ENGINEER or OWNER may reasonably require. The Payment Schedule shall be on the form provided in the Contract Documents or in a format acceptable to the ENGINEER or OWNER. On the second and all subsequent payments, partial Waivers of Lien and Sworn Statement shall be required for all Work completed and paid for on previous certificates.
- B. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by such data, satisfactory to OWNER, as will establish OWNER's title to the material and equipment and protect OWNER's interest therein, including applicable insurance. A receipted vendor's invoice showing the quantities of materials and the amounts paid will be required and shall accompany the Application for Payment.
- C. Retainage with respect to progress payments will be in accordance with paragraph 14.03, and it will be retained until after completion of the entire Work and its final acceptance. When the amount to be retained is reduced to less than 10 percent, CONTRACTOR shall file with OWNER the written consent of the Surety to such reduction and shall furnish an affidavit that all CONTRACTOR's indebtedness by reason of the Contract has been paid.

14.03 Retainage

- A. On Contracts with a dollar value of \$30,000 and greater or on Contracts that provide for more than 3 progress payments, progress payments and retainage shall be governed by the provisions of any statutes, rules or regulations regarding retention and these are incorporated herein by reference and made a part of this Contract.
- B. If there are no statutes, rules, or regulations applicable to retention, retainage shall be 10%, or such an amount as OWNER deems necessary.

14.04 Review of Applications for Progress Payment

- A. ENGINEER will, within 10 days after receipt of each Contractor's Application for Payment and Payment Schedule, including each resubmittal, either indicate in writing a recommendation of payment and present an Engineer's Certificate for Payment to OWNER, or may return the Application to CONTRACTOR indicating in writing ENGINEER's reasons for refusing to recommend payment. In the latter case, CONTRACTOR may make the necessary corrections and resubmit the Application.
- B. ENGINEER's recommendation of any payment requested in CONTRACTOR's Application for Payment will constitute a representation by ENGINEER to OWNER, based on ENGINEER's review of the Contractor's Application for Payment and Certificate for Payment and the accompanying data and schedules, as an experienced and qualified design professional that to the best of ENGINEER's knowledge, information and belief;
 - 1. the Work has progressed to the point indicated;
 - 2. the quality of the Work is in accordance with the technical aspects of the Contract Documents subject to an evaluation of the Work as a functioning Project upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for any Unit Price Work under paragraph 12.03, and any qualifications stated in the recommendation; and
 - 3. the conditions precedent to CONTRACTOR's being entitled to such payment appear to have been fulfilled in so far as it is ENGINEER's responsibility to observe the Work.
- C. However, by recommending any such payment ENGINEER will not thereby be deemed to have represented that:
 - 1. exhaustive or continuous on-Site inspections have been made to check the quality or the quantity of the Work; or
 - 2. involved detailed inspections of the Work beyond the responsibilities specifically assigned to ENGINEER in the Contract; or
 - 3. there may not be other matters or issues between the parties that might entitle CONTRACTOR to be paid additionally by OWNER or entitle OWNER to withhold payment to CONTRACTOR.
- D. Neither ENGINEER's review of CONTRACTOR's Work for the purpose of recommending payments nor ENGINEER's recommendation of any payment, including final payment, will impose responsibility on ENGINEER:
 - 1. to supervise, direct or control the Work;

2. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;
 3. for the failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of Work;
 4. for any failure of CONTRACTOR to perform or furnish Work in accordance with the Contract Documents;
 5. to make any examination to ascertain how or for what purposes CONTRACTOR has used the moneys paid on account of the Contract Price;
 6. to determine that title to any Work, materials, or equipment has passed to OWNER free and clear of Liens.
- E. ENGINEER may refuse to recommend the whole or any part of any payment if, in ENGINEER's opinion, it would be incorrect to make such representations as stated above to OWNER. ENGINEER may also refuse to recommend any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended to such extent as may be necessary in ENGINEER's opinion to protect OWNER from loss because:
1. the Work is defective, or completed Work has been damaged requiring correction or replacement;
 2. the Contract Price has been reduced because of Change Orders;
 3. OWNER has been required to correct defective Work in accordance with paragraph 13.09, or has accepted defective Work in accordance with paragraph 13.08;
 4. OWNER has been required to remove or remediate a Hazardous Environmental Condition for which CONTRACTOR is responsible;
 5. ENGINEER has actual knowledge of the occurrence of any of the events enumerated in paragraph 15.02.

14.05 Payment Becomes Due

- A. Thirty (30) days after presentation of the Application for Payment to OWNER with ENGINEER's recommendation, the amount recommended will (subject to the provisions of paragraph 14.05.B) become due, (or only if OWNER is a public agency, within 15 days after OWNER receives the funds which are to be provided by a department or agency of the federal or state government, whichever is later, or in accordance with any time periods required by any applicable statute, rule or regulation) and when due will be paid by OWNER to CONTRACTOR.
- B. OWNER may refuse to make payment of the full amount recommended by ENGINEER because:
1. Claims have been made against OWNER based on CONTRACTOR's conduct in the performance or furnishing of the Work, or OWNER has incurred costs, losses, or damages resulting from CONTRACTOR's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

2. 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;
 3. CONTRACTOR has failed to provide and maintain required bonds or insurance;
 4. OWNER has been required to remove or remediate a Hazardous Environmental Condition for which CONTRACTOR is responsible;
 5. 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;
 6. The Work is defective, requiring correction or replacement;
 7. OWNER has been required to correct defective Work in accordance with paragraph 13.09, or has accepted defective Work pursuant to paragraph 13.08;
 8. The Contract Price has been reduced by Change Orders;
 9. An event has occurred that would constitute a default by CONTRACTOR and therefore justify a termination for cause;
 10. Liquidated or other damages have accrued as a result of CONTRACTOR's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 11. 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;
 12. there are other items as set forth in the Contract Documents entitling OWNER to a set off against the amount recommended; or
 13. OWNER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.04.E.1 through 14.04.E.5.
- C. If OWNER refuses to make payment of the full amount recommended by ENGINEER, OWNER will give CONTRACTOR immediate written notice (with a copy to ENGINEER) stating the reasons for such action and promptly pay CONTRACTOR any amount remaining after deduction of the amount so withheld. OWNER shall promptly pay CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by OWNER and CONTRACTOR, when CONTRACTOR corrects, to OWNER's satisfaction, the reasons for such action. The reduction imposed shall be binding on CONTRACTOR unless CONTRACTOR duly submits a Change Proposal contesting the reduction.
- D. If it is subsequently determined that OWNER's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by paragraph 14.05.

14.06 CONTRACTOR's Warranty of Title

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

14.07 Substantial Completion

- A. When CONTRACTOR considers the entire Work ready for its intended use CONTRACTOR shall notify OWNER and ENGINEER in writing that the entire Work is substantially complete and request that ENGINEER issue a Certificate of Substantial Completion. CONTRACTOR shall at the same time submit to OWNER and ENGINEER an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after CONTRACTOR's notification, OWNER, CONTRACTOR, and ENGINEER shall make an inspection of the Work to determine the status of completion. If ENGINEER does not consider the Work substantially complete, ENGINEER will notify CONTRACTOR in writing giving the reasons therefor.
- C. Once ENGINEER considers the Work substantially complete, ENGINEER will deliver to OWNER a preliminary Certificate of Substantial Completion which shall fix the date of Substantial Completion. ENGINEER shall attach to the certificate a punch list of items to be completed or corrected before final payment. OWNER shall have 7 days after receipt of the preliminary certificate during which to make written objection to ENGINEER as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, ENGINEER concludes that the Work is not substantially complete, ENGINEER will, within 14 days after submission of the preliminary certificate to OWNER, notify CONTRACTOR in writing that the Work is not substantially complete, stating the reasons therefore. If OWNER does not object to the provisions of the certificate, or if despite consideration of OWNER's objections ENGINEER concludes that the Work is substantially complete, then ENGINEER will, within said 14 days, execute and deliver to OWNER and CONTRACTOR a final Certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as ENGINEER believes justified after consideration of any objections from OWNER.
- D. At the time of receipt of the preliminary Certificate of Substantial Completion, OWNER and CONTRACTOR will confer regarding OWNER's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by OWNER. Unless OWNER and CONTRACTOR agree otherwise in writing, OWNER shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon OWNER's use or occupancy of the Work.
- E. After Substantial Completion 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.

14.08 Partial Utilization

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

1. OWNER at any time may request CONTRACTOR in writing to permit OWNER to use any part of the Work which OWNER believes to be substantially complete and which may be so used without significant interference with construction of the other parts of the Work. If CONTRACTOR agrees, CONTRACTOR will certify to OWNER and ENGINEER that said part of the Work is substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time thereafter OWNER, CONTRACTOR and ENGINEER shall make an inspection of that part of the Work to determine its status of completion.
 - a. If ENGINEER does not consider that part of the Work to be substantially complete, ENGINEER will notify OWNER and CONTRACTOR in writing giving his reasons therefor.
 - b. If ENGINEER considers that part of the Work to be substantially complete, ENGINEER will execute and deliver to OWNER and CONTRACTOR a certificate to that effect, fixing the date of Substantial Completion for that part of the Work, attaching thereto a punch list of items to be completed or corrected before final payment.
2. Prior to issuing a certificate of Substantial Completion for that part of the Work, ENGINEER will deliver to OWNER and CONTRACTOR a written recommendation as to the division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, maintenance, utilities and insurance for that part of the Work, which shall become binding upon OWNER and CONTRACTOR at the time of issuing the definitive certificate of Substantial Completion for that part of the Work unless OWNER and CONTRACTOR shall have otherwise agreed in writing and so informed ENGINEER.
3. OWNER shall have the right to exclude CONTRACTOR from any part of the Work which ENGINEER has so certified to be substantially complete, but OWNER shall allow CONTRACTOR reasonable access to complete or correct items on the punch list.
4. In lieu of the issuance of a certificate of Substantial Completion as to part of the Work, OWNER may take over operation of a facility constituting part of the Work whether or not it is Substantially Complete if such facility is functionally and separately usable; provided that prior to any such takeover, OWNER and CONTRACTOR have agreed as to the division of responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, correction period, heat, utilities and insurance with respect to such facility.

14.09 Final Inspection

- A. Upon written notice from CONTRACTOR that the Work is complete, ENGINEER will make a final inspection with OWNER and CONTRACTOR and will notify CONTRACTOR in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. CONTRACTOR shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.10 Final Application for Payment

- A. After CONTRACTOR has completed all corrections to the satisfaction of ENGINEER and delivered all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, marked up record documents and other documents (all as required by the Contract Documents), and after ENGINEER has indicated that the Work is acceptable, subject to the provisions of paragraph 14.13, CONTRACTOR may make application for final payment following the procedure for progress payments.
- B. The final Application for Payment shall be accompanied by all documentation called for in the Contract Documents and such other data and schedules as ENGINEER may reasonably require, consent of Surety, if any, to final payment, together with complete and legally effective releases or waivers, satisfactory to OWNER, of all Liens arising out of or filed in connection with the Work.
- C. In lieu of the releases or waivers of Lien, if approved by OWNER, CONTRACTOR may furnish receipts or releases in full; an affidavit of CONTRACTOR that the releases and receipts include all labor, services, material and equipment for which a Lien could be filed, and that all payrolls, material and equipment bills, and other indebtedness connected with the Work for which OWNER or his property might in any way be responsible, have been paid or otherwise satisfied.
- D. If any Subcontractor, manufacturer, fabricator, Supplier or distributor fails to furnish a release or receipt in full, CONTRACTOR may furnish a Bond or other collateral satisfactory to OWNER to indemnify OWNER against any Claim or Lien.

14.11 Final Payment and Acceptance

- A. If, on the basis of ENGINEER's observation of the Work during construction and final inspection, and ENGINEER's review of the final Application for Payment and accompanying documentation (all as required by the Contract Documents), ENGINEER is satisfied that to the best of ENGINEER's knowledge, information and belief as a design professional that the Work has been completed and CONTRACTOR has fulfilled all of his obligations under the Contract Documents, ENGINEER will, within 10 days after receipt of the final Application for Payment, indicate in writing ENGINEER's Certificate for Payment and present the application to OWNER for payment. At that time ENGINEER will give written notice to OWNER and CONTRACTOR that the Work is acceptable subject to the provisions of paragraph 14.13.
- B. Otherwise, ENGINEER will return the Application to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application.
- C. If the Application and accompanying documentation are appropriate as to form and substance, OWNER shall, within 45 days (or within the time period required by any applicable statute, rule or regulation) after receipt thereof pay CONTRACTOR the amount recommended by ENGINEER less any amounts of OWNER claimed set-offs allowed under the Contract Documents, including but not limited to any applicable liquidated damages as determined by OWNER. If OWNER rejects the Application, OWNER shall do so in writing stating the appropriate sections of the Contract Documents upon which the rejection is based. CONTRACTOR may take the necessary remedial actions and resubmit the Application.

14.12 Final Completion Delayed

- A. If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed, and if ENGINEER so confirms, OWNER shall, upon receipt of CONTRACTOR's final Application for Payment and recommendation of ENGINEER, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by OWNER for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 5.01, the written consent of the Surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by CONTRACTOR to ENGINEER with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.13 Waiver of Claims

- A. The making and acceptance of final payment shall constitute:
1. a waiver of all Claims by OWNER against CONTRACTOR, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to paragraph 14.09, or from failure to comply with the Contract Documents or the terms of any special guarantees specified therein; and shall not constitute a waiver by OWNER of any rights in respect of CONTRACTOR's existing or continuing obligations under the Contract Documents; and,
 2. a waiver of all Claims by CONTRACTOR against OWNER other than those previously made in writing and still pending in accordance with Article 16.

14.14 Late Payments

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

Article 15 Suspension of Work and Termination

15.01 OWNER May Suspend Work

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

15.02 OWNER May Terminate for Cause

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

1. CONTRACTOR commences a voluntary case under any chapter of the Bankruptcy Code (Title 11, United States Code), as now or hereafter in effect, or if CONTRACTOR takes any equivalent or similar action by filing a petition or otherwise under any other federal or state law in effect at such time;
 2. a petition is filed against CONTRACTOR under any chapter of the Bankruptcy Code as now or hereinafter in effect at the time of filing, or if a petition is filed seeking any such equivalent or similar relief against CONTRACTOR under any other federal or state law in effect at the time relating to bankruptcy or insolvency;
 3. CONTRACTOR makes a general assignment for the benefit of creditors;
 4. a trustee, receiver, custodian or agent of CONTRACTOR is appointed under applicable law or under contract, whose appointment or authority to take charge of property of CONTRACTOR is for the purpose of enforcing a Lien against such property or for the purpose of general administration of such property for the benefit of CONTRACTOR's creditors;
 5. CONTRACTOR admits in writing an inability to pay its debts generally as they become due;
 6. CONTRACTOR persistently fails to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under paragraph 2.05 as revised from time to time);
 7. CONTRACTOR disregards Laws and Regulations of any public body having jurisdiction;
 8. CONTRACTOR disregards the authority of ENGINEER or OWNER; or,
 9. CONTRACTOR otherwise violates any provisions of the Contract Documents.
- B. OWNER may, after giving CONTRACTOR (and the Surety, if there be one) 7 days' written notice, and to the extent permitted by Laws and Regulations, terminate the services of CONTRACTOR, exclude CONTRACTOR from the Site, take possession of the Work and of all CONTRACTOR's tools, appliances, construction equipment, and machinery at the site and use the same to the full extent they could be used by CONTRACTOR (without liability to CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the Site or for which OWNER has paid CONTRACTOR but which are stored elsewhere, finish the Work as OWNER may deem expedient, and/or enforce the rights available to OWNER under any applicable Performance Bond.

- C. In such case, CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, damages and expenses sustained by OWNER arising out of or resulting from completing the Work, such excess will be paid to CONTRACTOR. If such claims, costs, losses, damages and expenses exceed such unpaid balance, CONTRACTOR shall pay the difference to OWNER. Such claims, costs, losses, damages and expenses incurred by OWNER will be reviewed as to reasonableness by ENGINEER and when so approved, incorporated in a Change Order, but when exercising any rights or remedies under this paragraph, OWNER shall not be required to obtain the lowest price for the Work performed.
- D. Where CONTRACTOR's services have been so terminated by OWNER, the termination shall not affect any rights or remedies of OWNER against CONTRACTOR or its Surety then existing or which may thereafter accrue. Any retention or payment of monies due CONTRACTOR by OWNER will not release CONTRACTOR from liability.

15.03 Termination for Convenience

- A. Upon 7 days' written notice to CONTRACTOR and ENGINEER, OWNER may, without cause and without prejudice to any other right or remedy, elect to terminate the Agreement. In such case, CONTRACTOR shall be paid (without duplication of any items):
 - 1. for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination;
 - 2. for actual expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials or equipment as required by the Contract Documents in connection with uncompleted Work; and
 - 3. for reasonable expenses directly attributable to protecting work as a result of termination.
- B. CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.
- C. Upon such termination, CONTRACTOR shall:
 - 1. Immediately discontinue Work on the date and to the extent specified in the notice except to the extent necessary to protect Work in place;
 - 2. Place no further orders for materials, services, or facilities, other than as may be necessary or required for completion of such portion of Work under the Contract that is not terminated;
 - 3. Promptly make every reasonable effort to obtain cancellation upon terms reasonably satisfactory to OWNER of all purchase orders and subcontracts to the extent they relate to the performance of Work terminated or assign to OWNER those orders and subcontracts and revoke agreements specified in such notice;
 - 4. Reasonably assist OWNER, as specifically requested in writing, in the maintenance, protection and disposition of property acquired by OWNER under the Contract Documents, as may be necessary;
 - 5. Complete performance of any Work which is not terminated; and

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

15.04 CONTRACTOR May Stop Work or Terminate

- A. If OWNER has failed to pay CONTRACTOR any sum finally determined to be due in accordance with the time limits specified in paragraph 14.05, CONTRACTOR may upon 7 days' written notice to OWNER and ENGINEER, stop the Work until payment of all amounts then due.
- B. If through no act or fault of CONTRACTOR, the Work is suspended for a period of more than 90 days by OWNER, or under an order of court or other public authority, then CONTRACTOR may, upon 7 days written notice to OWNER and ENGINEER and provided OWNER or ENGINEER does not remedy such suspension or failure within that time, terminate the Agreement and recover from OWNER payment on the same terms as provided in paragraph 15.03.
- C. The provisions of this paragraph 15.04 shall not relieve CONTRACTOR of his obligations under paragraph 6.22 to carry on the Work in accordance with the Progress Schedule and without delay during disputes and disagreements with OWNER.

Article 16 Final Resolution of Disputes

16.01 Methods and Procedures

- A. Disputes Subject to Final Resolution: The following disputed matters are subject to final resolution under the provisions of this Article:
 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
 2. Disputes between OWNER and CONTRACTOR concerning the Work or obligations under the Contract Documents and arising after final payment has been made.
- B. Final Resolution of Disputes: For any dispute subject to resolution under this Article, OWNER or CONTRACTOR may:
 1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or
 2. agree with the other party to submit the dispute to another dispute resolution process; or
 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, the following dispute resolution process shall be followed:
 - a. The parties shall submit the dispute to mediation under the mediation procedures outlined in the Construction Industry Arbitration Rules and Mediation Procedures of the American Arbitration Rules.
 - b. If the dispute is not resolved by mediation, the parties shall proceed to resolve the dispute by arbitration in accordance with the Construction Industry Arbitration Rules and Mediation Procedures of the American Arbitration Association. The decision of the arbitrator(s) shall be final and binding and is enforceable in a court of competent jurisdiction.

Article 17 Miscellaneous

17.01 Giving Notice

- A. Whenever any provision of the Contract Documents requires the giving of written notice to OWNER, ENGINEER, or CONTRACTOR, it shall be deemed to have been validly given only if delivered:
1. in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended;
 2. by registered or certified mail postage prepaid to, the last business address known to the giver of the notice;
 3. or delivered in person to such person by a commercial courier service or otherwise to the recipient's place of business; or
 4. by secure file transfer with receipt documentation or other document control software.

17.02 Computation of Time

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

17.03 General

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and shall not be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Law or Regulation, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this paragraph shall be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply.
- B. All representations, warranties and guarantees made in the Contract Documents shall survive final payment and termination or completion of this Agreement.

17.04 Professional Fees and Court Costs Included

- A. Whenever reference is made to "claims, costs, losses, damages and expenses," it shall include in each case, but not be limited to, all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs.

17.05 Nondiscrimination of Employment

- A. The CONTRACTOR shall covenant and agree not to discriminate against any employee or applicant for employment, to be employed in the performance of this Contract, with respect to his hire, tenure, terms, conditions or privileges of employment, or any matter directly or indirectly related to employment, because of race, color, sex, age, religion, national origin or ancestry, height, weight, or marital status, or any other classification protected by law, and to require a similar covenant on the part of any Subcontractor employed in the performance of the Contract.

17.06 Post Completion Date Engineering and Inspection Costs

- A. All engineering and inspection costs incurred after the specified completion date shall be paid by CONTRACTOR to OWNER prior to final payment authorization. However, CONTRACTOR shall not be charged with any post completion date engineering and inspection costs when the delay in completion of the Work is due to the following and CONTRACTOR has promptly given written notice of such delay to OWNER or ENGINEER:
1. to any preference, priority or allocation order duly issued by OWNER;
 2. to unforeseeable causes beyond the control and without the fault or negligence of CONTRACTOR, including but not restricted to, acts of God, or of the public enemy, acts of OWNER, acts of another contractor in the performance of a Contract with OWNER, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and abnormal and unforeseeable weather; and,
 3. to any delays of Subcontractors or Suppliers occasioned by any of the causes specified in this Article.
- B. Charges after the specified completion date shall be made at such times and in such amounts as ENGINEER shall invoice OWNER, provided, however said charges shall be in accordance with ENGINEER's current rate schedule at the time the costs are incurred. Engineering and inspection costs so incurred shall be deducted from CONTRACTOR's progress payments.

17.07 Waiver of Consequential Damages

- A. CONTRACTOR and OWNER waive Claims against each other for consequential damages arising out of or relating to this Contract or the Work. This mutual waiver includes but is not limited to:
1. damages incurred by OWNER for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
 2. damages incurred by CONTRACTOR for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit in connection with any other project or anticipated project.
- B. This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination or default. Nothing contained in this Section shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents. CONTRACTOR also waives any Claim for consequential damages against ENGINEER where such Claims arise out of or relate in any way to the Project or the Contract Documents.

17.08 No Waiver

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

17.09 Controlling Law

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

17.10 Headings

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

End of Section

Supplementary Conditions

These Supplementary Conditions amend or supplement the General Conditions as indicated below. All provisions which are not amended or supplemented remain in full force and effect. The terms used in these Supplementary Conditions have the meanings assigned to them in the General Conditions.

SC – 1.01 Defined Terms

Delete the definition for “Substantial Completion” in paragraph 1.01 of the General Conditions, and insert the following in its place:

Substantial Completion - The Work has progressed to the point where, in the opinion of the ENGINEER as evidenced by his definitive Certificate of Substantial Completion, it is sufficiently complete in accordance with the Contract Documents such that all rock revetment, fishing pier, kayak launch, plantings and restoration is complete, and only maintenance of planting areas, and seed and plant establishment remains for final completion.

The terms “Substantially Complete” and “Substantially Completed” as applied to any Work refer to Substantial Completion thereof.

SC - 4.02. Subsurface and Physical Conditions; Investigations and Reports

Add a new subparagraph immediately after paragraph 4.02.A of the General Conditions, which is to read as follows:

In the preparation of Plans and Specifications, ENGINEER has relied upon the following reports and tests of subsurface and latent physical conditions at the site or otherwise affecting cost, progress or performance of the Work:

Copies of the following reports and/or tests are attached as Exhibits:

Report of Geotechnical Investigation
Existing Waterfront Park Shelter
Jefferson Avenue
St. Clair Shores, Michigan
G2 consulting Group
Project No. 070183
March 26, 2007

SC – 5.03.D. Additional Insured

Add the following language at the end of paragraph 5.03.D. of the General Conditions:

The name insured on the OWNER's and CONTRACTOR's Protective Policy shall be: Charter Township of Harrison

Additional named insured on the OWNER's and CONTRACTOR's Protective Policy shall include:

1. Wade Trim Associates, Inc.

SC - 5.04. Insurance Limits of Liability

The required limits of liability for insurance coverages requested in paragraphs 5.03 of the General Conditions shall be not less than the following:

SC-5.04.A. Worker's Compensation

Coverage A - Compensation	Statutory
Coverage B - Employer's Liability	
Each Accident	\$ 100,000
Disease - Policy Limit	\$ 500,000
Disease - Each Employee	\$ 500,000

SC-5.04.B. Comprehensive General Liability* - Coverage Shall be Occurrence Form

General Aggregate	\$2,000,000 **
Products - Com/Ops Aggregate	\$2,000,000
Personal and Advertising Injury	\$1,000,000
Each Occurrence	\$1,000,000 **
Fire Damage (any one fire)	\$ 50,000
Medical Expense (any one person)	\$ 5,000

*Certificates shall show that X, C, and U coverage is included.

SC-5.04.C. Comprehensive Automobile Liability - Coverage Shall Include Owned, Nonowned, and Hired Autos

Bodily Injury - Per person	\$1,000,000
Bodily Injury - Per Accident	\$1,000,000 **
Property Damage	\$1,000,000
-or-	
Combined Single Limit	\$1,000,000 **

SC-5.04.D. OWNER's Protective Liability - Coverage Shall be Occurrence Form

Policy to be written with Harrison Charter Township as the insured.

General Aggregate	\$2,000,000
Each Occurrence	\$1,000,000

SC- 5.04.E. Builder's Risk-Installation Floater Cost To Replace At
Time Of Loss

SC-5.04.F. Umbrella or Excess Liability

** CONTRACTOR is granted the option of arranging coverage under a single policy for the full limits required or by a combination of underlying policies with the balance provided by an Excess Liability or Umbrella Liability policy, with the Each Occurrence and the Aggregate limits equal to the total limits requested.

SC-18 – Liquidated Damages

Add the following language as Article 18 of the General Conditions, entitled Liquidated Damages, which is to read as follows:

Article 18 – Liquidated Damages

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

The CONTRACTOR shall not be charged with liquidated damages or any excess cost when the delay in Substantial Completion of the Work is due to the following and the CONTRACTOR has given written notice of such delay within seven (7) calendar days to the OWNER or ENGINEER.

- A. To any preference, priority or allocation order duly issued by the OWNER.
- B. To unforeseeable causes beyond the control and without the fault or negligence of the CONTRACTOR, including but not restricted to, acts of God, or of the public enemy, acts of the OWNER, acts of another CONTRACTOR in the performance of a Contract with the OWNER, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and abnormal and unforeseeable weather; and
- C. To any delays of Subcontractors occasioned by any of the causes specified in Items A and B of this article.

SC-19 MDNR Grant Requirements (MNRTE)

Add the following language as Article 19 of the General Conditions, entitled MDNR Grant Requirements (MNRTE), which is to read as follows:

CONTRACTOR shall comply with all requirements of 1976 PA 453 (Elliot-Larsen Civil Rights Act) and 1976 PA 220 (Persons with Disabilities Civil Rights Act), as amended. CONTRACTOR and any subcontractors shall not discriminate against an employee or applicant for employment with respect to hire, tenure, terms, conditions, or privileges of employment, or a matter directly or indirectly related to employment, because of race, color, religion, national origin, age, sex, height, weight, marital status or a disability that is unrelated to the individual's ability to perform the duties of a particular job or position. A breach of this covenant will be regarded as a material breach of the Contract.

End of Section

(PROJECT NAME - ALL CAPS)
(PROJECT LOCATION – ALL CAPS)
ADDENDUM NO. __

To all prospective bidders and others concerned:

YOU ARE HEREBY ADVISED THAT the Contract Documents for the above referenced Project are revised in the following particulars:

<u>Page</u>	<u>Description of Change</u>
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This Addendum is hereby incorporated into the original Contract Documents for the bidding referred to above and is considered as binding as though originally appearing therein. RECEIPT of this ADDENDUM MUST BE NOTED in the place provided on the page P-1 dated _____.

Specifications

Division 01 General Requirements

Section 01 1100 Summary of Work

Part 1 General

1.01 Work Covered by Contract Documents

This Project includes construction of park improvements including grading, drainage, hard armor shore protection, park amenities, fishing pier, plantings, site restoration and related work.

1.02 Work by Others

There is no other work in the Project area, known to the OWNER, which would affect this Contract.

1.03 Right-of-Way Jurisdiction/Permits

Jefferson Avenue is under the jurisdiction of the Road Commission of Macomb County.

Lake St. Clair is under the jurisdiction of the U.S. Army Corps of Engineers (COE) and Michigan Department of Environment, Great Lakes, and Energy (EGLE).

Soil erosion and sedimentation control is under the jurisdiction of Macomb County Public Works.

The CONTRACTOR shall secure any permits required by the agency having jurisdiction, shall abide by all rules and regulations of each, and shall pay all costs in connection with the permits. The CONTRACTOR shall pay for all permit and inspection fees as the agencies may charge to insure compliance with their requirements.

1.04 Coordination

It shall be the responsibility of the CONTRACTOR to coordinate his operations and those of his subcontractors in such a manner so as to avoid interference and delays in the areas of common construction activities.

1.05 CONTRACTOR's Use of Premises

The CONTRACTOR shall maintain his construction operations within the presently existing road rights-of-way and easements throughout the Project area. In the event that the CONTRACTOR deems it necessary or advisable to operate beyond the limits of the existing rights-of-way or easements, he shall be responsible for making special written agreements with the property owners and shall furnish such copies of agreement to the OWNER.

1.06 Audio/Video Route Survey

An audio/video route survey as specified in Section 01 3300, Submittal Procedures, shall be required for this Project. Complete coverage shall include the complete area of the park including any staging or storage areas, the parking lot, playground, basketball court, volley ball court, a detailed 360° inside and outside view of the pavilion, and the outside of the restroom building.

The audio/video route survey shall be on USB Flash Drive.

1.07 Project Plaque

A project plaque shall be required for this Project. Project plaque can be ordered from: https://www.rmi-printing.com/customer_portal/document_library.html.

CONTRACTOR shall furnish to the OWNER the metal plaque.

Part 2 Products (Not Used)

Part 3 Execution (Not Used)

End of Section

Section 01 2200 Unit Prices

Part 1 General

1.01 Scope

This Section describes the method of measurement and basis of payment for all items of Work included in the Contract and specified in the Proposal. The CONTRACTOR shall provide all labor, material, tools, equipment and services required to complete the Work specified herein and indicated on the Plans.

THE OWNER WILL MAKE NO ALLOWANCES FOR ITEMS NOT INCLUDED IN THE PROPOSAL.

1.02 Items of the Proposal

Item 1

Waterfront Park Shoreline Improvements, Complete, will be paid for at the Contract Unit Price per Lump Sum. Price paid shall be payment in full for all labor, material, and equipment required to construct the park complete per the plans and specs and shall include, but is not limited to, construction of fishing pier, rock revetment, kayak launch, sidewalks, paths, and drainage system; construction of bioretention areas; plantings; maintenance of plantings; seeding; all excavation, embankment, and grading; soil erosion and sedimentation control; and all other items necessary to complete the work, whether specifically mentioned or implied.

Part 2 Products (Not Used)

Part 3 Execution (Not Used)

End of Section

Section 01 3119 Project Meetings

Part 1 General

1.01 Preconstruction Meeting

Prior to the delivery of materials or the start of any construction, the CONTRACTOR shall request a Preconstruction Meeting from the ENGINEER. A minimum three (3) working days' notification to meeting participants shall be required.

A. Schedule

The ENGINEER will establish the meeting place, time and date, distribute agenda, notify participants, and administer the meeting. CONTRACTOR shall notify major Subcontractors.

B. Attendance

1. OWNER
2. ENGINEER
3. CONTRACTOR
4. Major Subcontractors
5. Utility Companies
6. Safety Representatives
7. Governmental Agencies

C. Agenda

1. Distribution by CONTRACTOR and discussion, review and acceptance of:
 - List of names and telephone numbers for superintendent, foreman and other key personnel.
 - List of major Subcontractors and Suppliers.
 - Projected construction preliminary progress schedules.

- Preliminary schedule of Shop Drawings and Sample submittals.
 - Estimated monthly payment schedule and schedule of values
2. Critical Work sequencing.
 3. Major equipment deliveries and priorities.
 4. Project coordination.
 5. Responsibilities of OWNER, ENGINEER, CONTRACTOR and other agencies.
 6. Procedures and processing of:
 - Field decisions.
 - Proposal requests.
 - Submittals.
 - Change Orders.
 - Applications for Payment.
 7. Adequacy of distribution of Contract Documents.
 8. Procedures for maintaining Record Documents.
 9. Use of premises.
 10. Construction facilities, controls and construction aids.
 11. Temporary utilities.
 12. Safety and first aid procedures.
 13. Security procedures.
 14. Housekeeping procedures.
 15. Testing

D. Minutes

ENGINEER will prepare and distribute copies to participants within seven (7) days of meeting. Participants shall report corrections and comments within ten (10) days of receipt of minutes.

1.02 Progress Meetings

Periodic Progress Meetings will be held as required by the progress of the Work.

A. Schedule

The ENGINEER will establish the meeting place, time and date, distribute agenda, notify participants and administer the meeting. CONTRACTOR shall notify major Subcontractors.

B. Attendance

1. ENGINEER
2. CONTRACTOR
3. Subcontractor as appropriate to the agenda.
4. Suppliers as appropriate to the agenda.
5. Others

C. Agenda

1. Review minutes of previous meeting.
2. Review of work progress since previous meeting.
3. Review field observations, problems, conflicts.
4. Review problems which impede Construction Schedules.
5. Review of off-site fabrication, delivery schedules.
6. Review corrective measures and procedures to regain projected schedule.

7. Review revisions to Construction Schedules.
8. Review plan progress, schedule, during succeeding Work period.
9. Review coordination of schedules.
10. Review submittal schedules; expedite as required.
11. Review maintenance of quality standards.
12. Review proposed changes for:
 - Effect on Construction Schedule and on completion date.
 - Effect on other Contracts of the Project.
13. Other business.

D. Minutes

ENGINEER will prepare and distribute copies to participants and OWNER within seven (7) days of meeting for review at the next meeting.

Part 2 Products (Not Used)

Part 3 Execution (Not Used)

End of Section

Section 01 3300 Submittal Procedures

Part 1 General

1.01 General Requirements

- A. CONTRACTOR shall submit Shop Drawings, product data, and Samples, as required by the individual Specification sections, to ENGINEER for review in accordance with the provisions of General Conditions.

1.02 Progress Schedules

- A. CONTRACTOR shall submit one (1) electronic copy in PDF format of Progress Schedules indicating the starting and completion dates of the various stages of the Work and estimated payments to ENGINEER.
 - 1. Proposed Progress Schedules shall be submitted to ENGINEER prior to the pre-construction meeting.
 - 2. CONTRACTOR shall distribute hard copies of the Progress Schedules during the pre-construction meeting for discussion.
 - 3. Progress Schedules shall be updated by CONTRACTOR and submitted electronically (in PDF format) to ENGINEER, as a part of applications for progress payments, through completion of the Work. Failure to update Progress Schedule may be the basis for rejection of Applications for Progress Payments.

1.03 Shop Drawing Schedule

- A. CONTRACTOR shall submit one (1) electronic copy in PDF format of the Shop Drawing Schedule indicating the individual items and submission dates to ENGINEER.
 - 1. A preliminary Shop Drawing Schedule in accordance with the requirements in the General Conditions shall be submitted by CONTRACTOR prior to the pre-construction meeting.
 - 2. CONTRACTOR shall distribute hard copies of the Shop Drawing Schedule during the pre-construction meeting for discussion.
 - 3. A final electronic copy of the Shop Drawing Schedule (in PDF format) shall be submitted by CONTRACTOR at least ten (10) days prior to submitting the first Application for a Payment.

1.04 Schedule of Values

- A. CONTRACTOR, if applicable, shall submit one (1) electronic copy in PDF format Schedule of Values of the Work to ENGINEER.
 - 1. A preliminary Schedule of Values shall be submitted by CONTRACTOR prior to the pre-construction meeting.

2. CONTRACTOR shall distribute hard copies of the Schedule of Values during the pre-construction meeting for discussion.
3. A final Schedule of Values (in PDF format), prepared in accordance with the General Conditions and presented in sufficient detail to serve as the basis for payments during construction, shall be submitted to ENGINEER for review at least ten (10) days prior to submitting the first Application for Payment.

1.05 Staking Schedule

- A. CONTRACTOR shall submit one (1) electronic copy in PDF format of the staking schedule, in accordance with the "Construction Layout" specification section prior to the start of construction.
 1. The staking schedule should be updated as outlined in the Specifications and submitted by CONTRACTOR to ENGINEER through completion of the Work.

1.06 Applications for Payment

- A. CONTRACTOR shall submit one (1) electronic copy in PDF format Applications for Payment to ENGINEER in accordance with the provisions of Article 14 of the General Conditions.
- B. Applications for Payment shall be made on forms provided by or approved by ENGINEER.
 1. Sample CONTRACTOR's Application for Payment, Payment Schedule and ENGINEER's Certificate for Payment forms are included in the Contract Documents and can be obtained in digital format from ENGINEER.
- C. Copies of these forms, with Project specific information completed by ENGINEER, will be given to CONTRACTOR at the preconstruction meeting or, if applicable, after approval of the final Schedule of Values.
- D. CONTRACTOR shall submit a completed Payment Schedule with an executed Contractor's Application for Payment and Contractor's Declaration to ENGINEER not more often than once per month.
- E. ENGINEER will certify payments with the use of Engineer's Certificate for Payment.

1.07 Shop Drawings

- A. Shop Drawings shall be presented in a clear and thorough manner. Details shall be identified by reference to plan sheet number, detail number if applicable, and Specification section number, and article number.

1.08 Product Data

- A. Product Data shall be presented in a clear and thorough manner identified the same as the Shop Drawings. Included with the information shall be performance characteristics and capacities depicting dimensions and clearances required.

- B. Manufacturer's standard schematic drawings and diagrams shall be modified to delete information which is not applicable to the Work. Manufacturer's standard information shall be supplemented to provide information specifically applicable to the Work.

1.09 Samples

- A. Samples shall be of sufficient size and quantity to clearly illustrate functional characteristics of the product with integrally related parts and attachment devices depicting full range of color, texture and pattern.

1.10 Submission Requirements

- A. CONTRACTOR shall make Submittals in accordance with the approved schedule, and in such sequence as to cause no delay in the Work or in the work of any other Contractor. No damages will be awarded, or extension of time granted, due to the Shop Drawing and product data review process.
- B. CONTRACTOR shall submit an entire package of Shop Drawings and Product Data information for major items of Work so that ENGINEER can review the package as a unit.
- C. CONTRACTOR shall submit one (1) electronic copy in PDF format of Shop Drawings and Product Data information containing the following information at a minimum:
 - 1. Field dimensions clearly identified as such.
 - 2. Relation to adjacent or critical features of the Work or materials.
 - 3. Applicable standards, such as ASTM or Federal Specification Numbers.
 - 4. Identification of deviations from Contract Documents.
 - 5. Identification of revisions on resubmittals.
 - 6. Project Title, Date of Submission, Date of Previous Submission, and Specification Section number.
- D. CONTRACTOR shall initial or sign Shop Drawings and Product Data submittals, certifying CONTRACTOR's review and approval of Submittal per the General Conditions; verification of products, field measurements, field construction criteria, and coordination of the information within the submittal with requirements of the Work and of Contract Documents.
- E. ENGINEER shall initial or sign Shop Drawings and Product Data submittal and shall indicate the status of the Submittal, or requirements for resubmittal. ENGINEER shall return to CONTRACTOR one (1) electronic copy of the Shop Drawing and/or Product Data submittal (in PDF format) for distribution or for resubmission.

1.11 Engineer's Review

- A. Upon receipt of any Submittal defined above, ENGINEER will:
 - 1. Check each for completeness, clarity, correctness, cohesiveness, legibility, and reproducibility.

2. Review each only for general conformity with the Contract Documents as specified in the General Conditions.
- B. After review of any Submittal, ENGINEER will appropriately affix a stamp, electronic notation box or other means, signifying the Submittal as having received full consideration and review.
- C. The "status" of any such Submittal or portion thereof, as appropriate, will be evidenced by any one or more of the following notations clearly signified by a "X" or other similar mark placed in the box adjacent to the notation:
1. Notations for ENGINEER'S Review:
 - No Exceptions Taken
 - Note Markings
 - Comments Attached
 - Rejected
 2. Notations for Response Required by CONTRACTOR:
 - None
 - Confirm
 - Resubmit
- D. Notation Meanings:
1. Elements marked "No Exceptions Taken" indicate that CONTRACTOR may commence with construction, fabrication or purchase of such items provided CONTRACTOR.
 2. Elements marked "Note Markings" indicate that the CONTRACTOR may commence with construction, fabrication or purchase of such items provided the CONTRACTOR.
 - a. Proceeds in strict accordance with ENGINEER's notes and/or required corrections/deletions/additions indicated thereon;
 - b. Pending appropriate response by CONTRACTOR as further noted.
 3. Elements marked "Comments Attached" indicate that further comments or explanations have been affixed to the Submittal, which may require action(s) by CONTRACTOR as further noted.
 4. Elements marked "Rejected" indicate that CONTRACTOR must make the required corrections as shown or noted and resubmit such items to ENGINEER for further review.
 5. Elements marked "None" indicate that the Submittal requires no further action by CONTRACTOR.
 6. Elements marked "Confirm" require CONTRACTOR to provide affirmation to ENGINEER regarding comments, notes, markings, etc. made by ENGINEER, and to affirm that CONTRACTOR will comply with the comments, notes, markings, etc.
 7. Elements marked "Resubmit" indicate that CONTRACTOR may not commence with construction, fabrication or purchase of such items, and

that CONTRACTOR must resubmit items for review that comply with the Contract Documents in the event that those originally submitted do not, or with any comments, notes, markings, etc. made by ENGINEER.

1.12 Resubmission Requirements

- A. CONTRACTOR shall make all corrections or changes in the Submittals required by ENGINEER and resubmit. CONTRACTOR shall indicate any changes which have been made other than those requested by ENGINEER.

1.13 Manufacturer's Operation and Maintenance Data

- A. CONTRACTOR shall submit one (1) electronic copy in PDF format and one (1) bound copy of all operation and maintenance data required per the various Specification sections.
 - 1. Prior to 50% completion of the Project, CONTRACTOR shall have submitted one (1) acceptable copy to ENGINEER for review.
- B. Final copies of the operation and maintenance data shall be bound in a suitable number of 3-inch or 4-inch, 3-ring hard cover binders. Permanently imprinted on the cover shall be the words "Manufacturer's Operation and Maintenance Data", Project title, location of the Project, and the date. A table of contents shall be provided in the front of each binder to list the various sections in the manual.
- C. The information to be provided in each section of the manual, for each piece of equipment and project component shall include, but not be limited to, detailed equipment drawings; sections cut through all of the major equipment and subassemblies; installation and operational procedures; complete wiring and piping schematics; lubrication materials and procedures; maintenance procedures; and parts lists complete enough to permit identification of parts by nomenclature, manufacturer's part number and use.
- D. At the front of each section a maintenance schedule shall be provided for each piece of equipment in the section.
 - 1. The schedule shall display the daily, weekly, monthly, semi-annual, annual or fraction thereof, lubrication and preventative maintenance required in order to meet warranty conditions and the manufacturer's recommendations for optimum performance and life of the unit.
 - 2. A common schedule format is to be developed and used for all of the sections. Photocopies or reproductions of the manufacturer's literature will not be accepted.

1.14 Audio/Video Route Survey

- A. When required in the Summary of Work, Section 01 1100, or the Proposal, CONTRACTOR shall furnish ENGINEER with an "Audio/Video Route Survey" record of the existing conditions prior to the start of construction. CONTRACTOR must enlist the services of a firm having a minimum of one (1) year experience in audio/video recording of construction projects.
- B. Prior to beginning the audio/video recording, CONTRACTOR shall review with ENGINEER the Project requirements to ensure that the audio/video is adequate for its intended purpose. OWNER shall have the authority to designate areas for which

coverage may be added or omitted. The audio/video recording shall be done prior to placement of materials or equipment on the construction area and furnished one (1) week prior to the pre-construction meeting.

C. Format:

1. Audio/Video route survey shall be submitted in the format(s) as specified in Section 01 1100, Summary of Work.

- (1) Audio/video route survey submission shall be on USB media
- (2) Format: USB - Video
- (3) Video Encoding: Highest available bit rate (6-9 Megabit), 60 fields per second interlaced video
- (4) Audio Encoding: Uncompressed stereo wave or stereo Dolby Digital (256 kilobit or better)
- (5) Aspect Ratio: 4x3 (720x480 pixels)
- (6) No Macrovision or other copy protection encoding. No region code or region code 1.

D. Complete coverage shall include all surface features located within the public right-of-way, easement areas and adjacent private properties up to building line when such properties lie within the zone of influence of construction and will be supported by appropriate audio description made simultaneously with video coverage. Such coverage shall include, but not be limited to, all existing driveways, sidewalks, curbs, ditches, roadways, landscaping, trees, culvert, headwalls, retaining walls, and buildings located within such zone of influence. Video coverage shall be clear enough to identify cracks, depressions, holes and other defects in existing surfaces.

E. Houses and buildings shall be identified visually by house number, when visible, in such a manner that structures of the proposed system can be located by reference. In all instances, however, location shall be identified by audio or visual means at intervals not-to-exceed 100 linear feet (30 m) in the general direction of travel.

F. When conventional wheeled vehicles are used, the distance from the camera lens to the ground shall be not less than 12 feet (3.5 m) to ensure proper perspective. The rate of speed in the general direction of travel of the conveyance used during recording shall not exceed 30 feet/minute (10 m/min). Panning rates and zoom-in, zoom-out rates shall be controlled sufficiently such that stop action during play-back will produce clarity of detail of the object viewed.

G. Video recordings must, by electronic means, display continuously and simultaneously generated transparent digital information in the upper left hand third of the screen to include the date and time of recording, as well as the corresponding engineering stationing numbers as shown on the Contract Drawings.

1. The date information will contain the month, day, and year. For example, mm/dd/yy, and be placed directly below the time information.

2. The time information shall consist of hours, minutes, and seconds, separated by colons. For example, hh:mm:ss.
- H. Engineering stationing numbers must be continuous, accurate and correspond to the Project stationing and must include the standard engineering symbols. For example, Station 14+84.
- I. Recording shall be done during times of good visibility. No recording shall be done during periods of visible precipitation, or when more than ten (10) percent of the ground area is covered with snow or standing water, unless otherwise authorized by OWNER.
- J. In some instances, audio/video coverage may not be suitable for recording necessary details. In such instances, OWNER may specify still photographs to provide coverage. One (1) color photograph shall be provided in accordance with Article 1.15 of this Section with a suitable description of the photograph's location.
- K. Any portion of the Audio/Video Route Survey of insufficient quality as determined by ENGINEER shall be redone by CONTRACTOR at no additional cost to OWNER.
- L. Each USB shall be properly identified with the Project Title, location, time, and date in a manner acceptable to OWNER.

1.15 Photographs

- A. When required in the Summary of Work, Section 01 1100, or the Proposal, Section 00 4243, CONTRACTOR shall furnish ENGINEER with a total of 6 to 10 digital color photographs each month during construction of the Project, unless some other number and times is specified in the Summary of Work.
- B. Photos shall be in digital format (i.e., JPEF, TIFF, GIF, PNG or PDF) and shall have a minimum resolution of 300 dpi.
- C. The following information shall be placed on the photo itself or embedded in the digital file:
 1. Project Title
 2. Contract Number
 3. Description of photo's content
 4. Date and Time of photo
- D. CONTRACTOR shall submit photographs monthly along with the Application for Payment as described in Article 14 of the General Conditions.

Part 2 Products (Not Used)

Part 3 Execution (Not Used)

End of Section

Section 01 4500 Quality Control

Part 1 General

1.01 General Requirements

Sampling of materials will be made by the ENGINEER in accordance with the methods designated by the Specifications. The CONTRACTOR shall furnish such facilities as the ENGINEER may require for collecting, storing, and forwarding samples to the Laboratory. The CONTRACTOR in all cases shall furnish the required samples to the OWNER without charge.

1.02 Tests of Materials

All materials in the Work shall meet the requirements of the Contract Documents.

Tests of materials will be made as specified herein. The ENGINEER shall at all times have access to all materials intended for use in the Work as well as to the plants where such materials are produced. Plant inspection may be made if the quantities are sufficient to warrant such inspection and if it is to the best interest of the OWNER. In any case materials may be either inspected or tested when received on the Project.

Materials shall not be used until approval has been received from the ENGINEER. Approval of materials at the producing plant does not constitute a waiver of the ENGINEER's right for re-examination at the Project site.

The standards for testing materials unless otherwise specified, shall be as established by the American Society for Testing and Materials (ASTM). All tests of materials will be made in accordance with the methods described or designated in the Specifications.

The sampling and testing of all materials not specifically mentioned shall be done by generally accepted methods, unless otherwise specified by the ENGINEER.

1.03 Certification of Materials

At the request of the ENGINEER, the CONTRACTOR shall provide the ENGINEER with certification that the various materials to be used conform to the standards referred to in the Contract Documents.

1.04 Source Quality Control

Testing identified in the Specifications as Source Quality Control, which is required to establish quality of materials, equipment or fabricated items, shall be paid for by the CONTRACTOR.

1.05 Inspector Days

Resident Project Representative(s) will be assigned to the Project by the ENGINEER, as necessary (in the opinion of the ENGINEER) to adequately monitor the CONTRACTOR's work. When multiple CONTRACTOR crews are working on the Project, multiple Resident Project Representatives may be assigned to the Project.

If the quantity of Work under the Contract is changed, the number of "Inspector Days" shall be increased or decreased as determined by Article 10 or 11 of the General Conditions. This revision in the number of Inspector Days shall be agreed upon at the time the Contract quantities are revised.

The CONTRACTOR shall give the ENGINEER at least 48 hours notice, exclusive of Saturdays, Sundays or holidays, when the Project requires an increase or decrease in the number of Resident Project Representatives. Failure to observe this requirement will either necessitate the charging of 4 hours show-up time if the Resident Project Representative appears on the Project, or the halting of all additional operations until a Resident Project Representative is available. Unless the Resident Project Representative is notified in advance, Inspector days will be charged when a Resident Project Representative appears on a project and the CONTRACTOR decides not to work. A separate Inspector day or a partial Inspector day shall be charged for each and every Resident Project Representative working on a project for monitoring purposes.

Part 2 Products (Not Used)

Part 3 Execution (Not Used)

End of Section

Section 01 5000 Temporary Facilities and Controls

Part 1 General

1.01 Site Access and Parking

The CONTRACTOR shall locate roads, drives, walks and parking facilities to provide uninterrupted access to construction offices, mobilization, Work, storage areas, and other areas required for execution of the Contract. Access drives and parking areas shall be hard surfaced unless otherwise approved by the ENGINEER.

The CONTRACTOR shall maintain driveways a minimum of 15 feet (5 m) wide between and around combustible materials in storage and mobilization areas.

The CONTRACTOR shall maintain traffic areas as free as possible of excavated materials, construction equipment, products, snow, ice, and debris.

The CONTRACTOR shall not utilize existing parking facilities for construction personnel or for CONTRACTOR's vehicles or equipment, unless written permission from owner of parking facility is obtained.

1.02 Trucking Route and Public Road Maintenance

Prior to the start of construction, the CONTRACTOR shall submit for review a schedule and list indicating the streets and roads within the municipality that his equipment will use off the Project site.

The CONTRACTOR shall comply with all safety requirements, weight restrictions and speed limits.

All gravel and dirt roads or streets used shall be maintained by grading, placing dust palliatives and maintenance gravel in sufficient quantities to eliminate dust and maintain traffic.

Paved streets shall be maintained in a reasonable state of cleanliness and the CONTRACTOR shall remove accumulations of debris, dirt or mud caused by his operations. Removal shall be done in such a manner as to prevent the release of dust. This shall be done at least every day at the close of

each day's operation or additionally when requested by the ENGINEER.

Any roads or streets damaged by the CONTRACTOR's operations, shall be repaired or removed and replaced to satisfactions of the agency having jurisdiction at no additional cost to the Project.

In order to insure adequate street maintenance and restoration as outlined above, the CONTRACTOR may be required to deposit with the Agency having jurisdiction a cash Road Protection Bond. This Bond, if required, will be held in escrow until final release is given by the Agency having jurisdiction. In the event the CONTRACTOR fails or neglects to maintain or restore the streets to the satisfaction of the Agency having jurisdiction, the Agency having jurisdiction shall have the required maintenance or restoration work done and the cost incurred shall be deducted from the Road Protection Bond. At the completion of the Project, the Agency having jurisdiction shall return the Road Protection Bond less any monies expended by the Agency having jurisdiction and shall render to the CONTRACTOR an accounting of all monies so expended.

The CONTRACTOR shall not store any equipment, supplies, construction material or excess excavated material on any roads or streets unless otherwise approved by the ENGINEER.

1.03 Emergency Access

The CONTRACTOR shall at all times provide emergency access to property in the vicinity of the construction for police vehicles, fire equipment, ambulances or other emergency vehicles to protect life, health and property. Any areas damaged by emergency vehicles shall be restored by the CONTRACTOR at no additional cost to the OWNER.

1.04 Private or Public Roads, Sidewalks, and Parking Areas

Where public roads, driveways, parking areas and sidewalks are encountered throughout the community, the CONTRACTOR shall maintain

those portions affected by the construction operations in a passable condition until such time as final restoration of these improvements can be made as specified. If, in the opinion of the ENGINEER, the public safety is in danger or the necessity exists for maintaining traffic, the ENGINEER may direct that backfilling be completed immediately. In the event that the necessary backfill material and equipment are not available when direction is given for immediate backfill, the trench shall be backfilled with native material to provide for the necessary maintenance of traffic and safety; however, the native material shall be removed within 48 hours and the trench properly backfilled as specified.

Where private roads are encountered throughout the community, the CONTRACTOR shall maintain those portions affected by its construction operations in a passable condition. These roads shall be maintained by the use of 21A road maintenance gravel, stone or slag. In the event the original subbase has been destroyed, the CONTRACTOR shall furnish and install 1-inch to 2-inch (25 to 50 mm) aggregate to stabilize the existing subbase. Upon completion of the construction activities, the CONTRACTOR shall shape and regrade these roads leaving them in a condition as good as or better than original, and adequate for normal travel.

1.05 Work Within Railroad Company Right-of-Way

The CONTRACTOR shall be responsible for complying with the requirements of the Railroad Company for all Work of the Project and/or temporary crossings for trucking routes. Unless otherwise provided by an item of these Specifications, the CONTRACTOR shall bear all costs and expenses incidental thereto, including, but not limited to, protection, flagmen, construction engineering inspection by the railroad, and incidental work such as drainage facilities and removal, alteration and replacement of railroad fences.

1.06 Road Closing

No street, road or section thereof shall be closed to through traffic unless otherwise provided for on the Plans, Specifications, or authorized by the agency with jurisdiction over the roads. Prior to closing a street, road, or section thereof, the

CONTRACTOR shall provide the ENGINEER with a copy of a detour plan approved by the agency having jurisdiction over the roads.

In the event roads or streets are to be closed, the CONTRACTOR shall notify the local fire department, police department, local road authority, ambulance and emergency services, Department of Public Works, public transit authority and public school system daily as to what streets will be partly blocked or closed, the length of time the streets will be blocked or closed and when the streets will be reopened to traffic. The CONTRACTOR shall designate one responsible employee to carry out the requirements of this condition.

During the time that the road is closed, the CONTRACTOR shall make provision for trash, leaf, and rubbish pickup.

1.07 Maintaining Traffic

The CONTRACTOR shall provide access for local traffic to property along the Project by means of temporary roads, drives, culverts or other means approved by the ENGINEER. The CONTRACTOR shall grade, add surfacing materials, and dust palliatives to such temporary roads and drives as necessary for the proper maintenance of traffic.

Where the shoulder is used to maintain traffic, the shoulder shall be graded, surfaced, treated for dust, constructed, or reconstructed, as specified herein or as shown on the Plans. If the construction work is suspended due to weather conditions, winter shut down or for any other reason, sufficient labor, materials and equipment shall be ready for immediate use at all times for the proper maintenance of traffic. Surfacing materials and dust palliatives shall be applied at such times and locations and in such amounts as necessary to safely maintain traffic and as determined by the ENGINEER.

Where shoulders are low, high, soft or rough, adequate provisions shall be taken to inform and protect the traveling public by means such as construction warning signs, barricades, lighted devices, etc. Such shoulder hazards shall be eliminated as soon as practicable.

The CONTRACTOR shall furnish, erect and maintain all signs, barricades, lights, and traffic

regulators, in accordance with the requirements of the current "Michigan Manual of Uniform Traffic Control Devices". Furnish all flagmen and watchmen as are necessary to maintain and safeguard traffic along the entire Project. Failure to comply with these requirements may be cause for the OWNER to issue a stop Work order, which shall remain in effect until all necessary devices are in place and operational. The issuance of a stop Work order shall not be reason for granting additional compensation or an extension to the Contract Time. Furnishing, installing, and maintaining traffic control devices shall be incidental to the Project unless otherwise provided for in the Proposal.

1.08 Existing Signs

No stop sign, traffic control or warning device or sign shall be taken down until the agency having jurisdiction over the roads has been notified and arrangements for the immediate reinstallation has been made. The CONTRACTOR shall provide temporary signs, traffic control devices, warning devices, or watchmen continuously from the time the item is removed until it is reinstalled. All signs removed shall be replaced with signs meeting requirements of the agency having jurisdiction over the roads.

1.09 Temporary Electricity and Lighting

The CONTRACTOR shall be responsible for and pay all costs for the installation and removal of circuit and branch wiring, with area distribution boxes located so that power and lighting is available throughout the construction by the use of construction-type power cords and shall pay all costs of electrical power used.

Electrical wiring and distribution shall conform to the National Electrical Code as adopted by the State of Michigan.

1.10 Telephone

The CONTRACTOR is required by MIOSHA regulations to provide telephone service for contacting emergency services. Such emergency telephone service shall also be available for the use of the OWNER and ENGINEER whether or not a field office is required for the Project. Emergency phone numbers are required to be posted per MIOSHA regulations

The CONTRACTOR shall pay all costs for installation, maintenance and removal, and service charges for local calls to provide service for his construction site office as well as for the ENGINEER's field office. Toll charges for calls relating to Project business shall be at the CONTRACTOR'S expense.

1.11 Use of Water

The CONTRACTOR shall acquire any and all permits, post any bonds and pay all fees required by the local agency having jurisdiction prior to using any hydrant or any other source of water. The CONTRACTOR shall reimburse the local community for all water consumed during course of the Project at the current rate as set by the agency having jurisdiction.

1.12 Sanitary Provisions

The CONTRACTOR shall be responsible for installation, maintenance and removal of temporary sanitary facilities per MIOSHA regulations for use of construction personnel including the OWNER and ENGINEER. All rules and regulations of the State and local health officials shall be observed, with precautions taken to avoid creating unsanitary conditions.

1.13 Potable Water

The CONTRACTOR shall furnish a supply of potable water per MIOSHA requirements, available for use of construction personnel including the OWNER and ENGINEER.

1.14 Medical Services and First Aid

The CONTRACTOR shall furnish first aid supplies and a person trained in first aid with a valid first aid certificate, per MIOSHA requirements, available for use of construction personnel including the OWNER and ENGINEER. The CONTRACTOR shall also furnish a communication system for contacting emergency services. The telephone numbers of the physician, hospital, or emergency services shall be conspicuously posted at the job site.

1.15 Postal Service

Several or all residents of this Project area may receive their mail at roadside mailboxes. Since the postal service will not deliver mail to a resident without a mailbox or a mailbox that is not in its proper position, the CONTRACTOR shall relocate, replace and repair all mailboxes and posts in a condition and height acceptable to the post office within 24 hours of the removal. If required, the CONTRACTOR shall furnish new posts for the mailboxes if the existing posts are broken or rotted to the extent that they cannot be reused. Any mailbox damaged by the CONTRACTOR while carrying out his operations or by anyone else while the box is down due to the CONTRACTOR's operation, shall be replaced by the CONTRACTOR with a new mailbox meeting the postal officials' specifications and the resident's name and address neatly lettered with paint or other acceptable means to the satisfaction of the resident and postal authorities. The cost for relocating mailboxes shall be incidental to the Project unless otherwise specified in the Proposal.

1.16 Newspaper Delivery

Several or all residents of this Project area may receive their newspapers at roadside tubes. Since the resident arranges for newspaper delivery, the CONTRACTOR shall notify the resident 24 hours prior to removal of any newspaper tube. Any tube damaged by the CONTRACTOR while carrying out his operations or by anyone else while the tube is down due to the CONTRACTOR's operation, shall be replaced as agreed between the CONTRACTOR and the newspaper who owns the damaged tube. The cost shall be incidental to the Project.

1.17 Bus Stops and Shelters

Prior to the start of any construction, the CONTRACTOR shall notify the transit authority that has any bus stops within the area of the Work. Removal, relocation and/or replacement of signs and/or benches shall be the responsibility of the CONTRACTOR in accordance with any requirements of the transit authority. The cost shall be incidental to the Project.

1.18 ENGINEER's Field Office

When called for in the Summary of Work, Section 01 1100, the CONTRACTOR shall furnish and maintain, for the exclusive use of the ENGINEER, an approved weatherproof building as a field

office. The building shall be located as directed by the ENGINEER, in full view of the Work and with at least one (1) window facing construction operations. The ENGINEER's field office shall meet the following minimum requirements:

- securely fixed to foundation
- structurally sound and watertight
- stairs and landings for doors as necessary
- three hundred (300) square feet (28 m²)
- three operable and locking windows with screens and storms.
- two locking, standard sized, entrance/exit doors
- two telephone lines
- two telephone jacks for each line
- one telephone
- one facsimile machine
- 120 volt electrical service per NEC, complete
- one 36" x 42" (1m x 1.1m) drafting table
- one drafting stool
- one 30" x 60" (.75m x 1.5m) desk
- one four drawer locking file cabinet
- two desk chairs
- one plan rack (minimum capacity eight plan sets)
- one first aid kit
- one 10A:80-B:C fire extinguisher
- automatically controlled heating, ventilating, air conditioning system to maintain temperature between 68° and 76° F (20° and 25° C) year round

The CONTRACTOR shall furnish and maintain bottled water and sanitary facilities for the field office. The CONTRACTOR shall clean the office at least once per week. The CONTRACTOR shall provide and pay for all utility service throughout the duration of the Project, including telephone service and long distance telephone service.

A trailer having equal facilities and floor space may be used in place of the above described field office if so desired.

The field office shall be furnished with a minimum of an aggregate surfaced driveway and parking area, for the exclusive use of the ENGINEER, for at least three (3) vehicles. CONTRACTOR shall maintain parking area including snow removal.

The cost for furnishing and installing the field office, for furnishing utilities and utility service, and for maintenance of the field office and

facilities, unless otherwise specified in the Proposal, will not be paid for separately but shall be included in the price bid for various items of Work under the Contract. The building shall be removed by the CONTRACTOR upon completion of the Contract and shall become his property.

1.19 By-Pass Pumping

The CONTRACTOR shall maintain flow in existing sewers at all times by pumping, bypassing, or fluming as necessary. During wet weather events, the flow in the sewer will rise rapidly and may become surcharged. The CONTRACTOR shall maintain flow in such a manner as the existing flow can be adequately transported including wet weather flow. The CONTRACTOR shall furnish, install, operate, and maintain temporary pumping facilities to service the upstream area including piping, temporary channels, pumps, sumps, controls, temporary plugs, and bulkheads.

For sanitary sewerage, by-pass piping shall be PVC Schedule 80, ABS truss pipe, or equivalent with solvent welded joints, or HDPE with butt fused joints. Flexible hoses of whatever types are not acceptable. All by-passed flow shall be discharged to a sanitary sewer of acceptable size to handle the bypassed and existing flows. The CONTRACTOR shall plan his operation such that there will be no backups, leaks, or discharges of pollutants.

The CONTRACTOR shall also furnish and have available on-site, redundant pumping facilities in case of any failure of the pumping system including pumps, piping, electrical, connections, etc. Redundant pumping facilities also include having a backup power generator in case the primary power source fails. The CONTRACTOR shall provide an adequate labor force to oversee the by-pass pumping including providing labor to maintain 24 hour per day operation and emergency backup service.

All costs for pumping and by-passing flow shall be included in the unit price bid for other items of Work unless otherwise specified in the Proposal.

The CONTRACTOR shall submit a by-pass pumping/diversion scheme to the ENGINEER for approval not less than 15 days prior to any anticipated by-pass pumping/diversion. By-pass

plan shall include pumping capacity and expected flow rates.

Part 2 Products

2.01 Barricades, Arrow Boards, Temporary Pavement Markings, and Temporary Signs

Barricades, Arrow Boards, Temporary Pavement Markings, Temporary Signs, and other traffic control devices shall be in accordance with the current edition of the MDOT Standard Specifications for Construction, and the current edition of the Michigan Manual of Uniform Traffic Control Devices.

Part 3 Execution (Not Used)

End of Section

Section 01 5713 Temporary Erosion and Sediment Control

Part 1 General

1.01 Scope

This Section includes furnishing, installing, maintaining, and removing at project completion, Soil Erosion and Sedimentation Control devices. Devices include silt fence, straw bales, turbidity barriers, temporary gravel construction entrance/exits, inlet filters, ditch sediment traps, etc.

1.02 Related Work Specified Elsewhere

1. Unit Prices: Section 01 2200
2. Site Construction Performance Requirements: Section 01 8900
3. Grading: Section 31 2200
4. Subgrade Preparation: Section 31 2313
5. Dewatering: Section 31 2319
6. Trenching , and Backfilling: Section 31 2333
7. Slope Protection: Section 31 3500
8. Water Utility Distribution Piping: Section 33 1100
9. Sanitary Utility Sewerage Piping: Section 33 3000
10. Sanitary Utility Force Mains: Section 33 3400
11. Storm Utility Drainage Piping: Section 33 4100
12. Seeding: Section 32 9219
13. Sodding: Section 32 9223

1.03 Reference Standards

ASTM American Society for Testing and Materials

1.04 Requirements of Regulatory Agencies

The CONTRACTOR, at his expense, shall secure all permits, and post all bonds or deposits required to comply with the "Soil Erosion and Sedimentation Control," requirements, being Part 91 of PA 451 of 1994 as amended and the National Pollution Discharge Elimination System (NPDES) Rules for storm water discharges from construction activity.

Comply with all requirements of the agency having jurisdiction. OWNER may withhold payment to CONTRACTOR equivalent to any fines resulting from non-compliance with applicable regulations.

1.05 Performance Requirements

Employ Best Management Practices as defined by standard EPA 832-R-92-005.

Put preventative measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.

Control increased storm water runoff due to disturbance of surface cover due to construction activities for this Project. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall event that might occur in 10 years.

Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this Project.

Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this Project. Prevent windblown soil from leaving the project site. Comply with fugitive dust ordinances of agencies having jurisdiction. Prevent tracking or flowing of mud

and sediment onto public or private roads, sidewalks or pavements outside of the site.

Prevent sedimentation of waterways on or off the project site, including rivers, streams, lakes, ponds, open drainage ditches, storm sewers, and sanitary sewers. If sedimentation occurs, install or correct preventative measures immediately at no cost to the OWNER. Comply with requirements of agencies having jurisdiction.

Maintain temporary preventative measures until permanent measures have been established. Remove temporary measures when permanent measures have been established.

If erosion or sedimentation occurs due to non-compliance with these requirements, remove deposited sediment or restore eroded areas at no cost to the OWNER.

1.06 Submittals

Submit schedule of Soil Erosion and Sedimentation Control activities to agency having jurisdiction. Include events (with days and/or dates of the various activities) for review and approval prior to obtaining a permit.

Part 2 Products

2.01 Silt Fence

Polypropylene geotextile fabric, resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; meeting the following requirements:

1. Average Opening Size: 30 U.S. Std. Sieve 600 μm), maximum; ASTM D4751.
2. Permittivity: 0.05 sec^{-1} , minimum; ASTM D4491.
3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength; ASTM D4355 after 500 hours exposure.
4. Tensile Strength: 100 lb-f (445 N) minimum, in cross-machine direction; 124 lb-f (551 N) minimum in machine direction; ASTM D4632
5. Elongation: 15 to 30 percent; ASTM D4632.

6. Tear Strength: 55 lb-f (244 N) minimum; ASTM D4533

Posts shall be 2 by 2-inch (50 mm x 50 mm) cross section hardwood stakes, minimum 3-feet (1.0 m) long.

2.02 Turbidity Barrier

Geotextile fabric curtain suspended from flotation devices at the water surface and held in a vertical position by a ballast chain in the lower hem. Turbidity barrier curtain shall meet the following minimum requirements unless otherwise specified on the plans.

1. Consist of vinyl laminate on 1000 denier polyester fabric weighing 18 ounce per square yard (610 g/m^2) minimum.
2. Tensile strength of fabric shall be 220 lbs (100 kg) minimum.
3. Edges of fabric to be reinforced with minimum 5/8-inch (16 mm) diameter polypropylene rope.
4. Ballast chain minimum 5/16-inch (8 mm) galvanized steel.
5. Buoyancy blocks providing buoyancy of 18lbs/l.f (27 kg/m).
6. Length of curtain (water depth) 5-feet (1.5 m).

2.03 Dewatering Discharge Filter Bag

UV-stabilized, non-woven geotextile bag to filter sediment from water prior to discharging. Geotextile fabric shall meet the following minimum average roll requirements:

1. Tensile Strength: 180 lb-f (200 N) minimum; ASTM D4632
2. Elongation: 50 percent minimum; ASTM D4632
3. CBR Puncture Strength: 300 lb-f (667 N) minimum; ASTM D6241
4. Trapezoidal Tear: 70 lb-f (310 N) minimum; ASTM D4533
5. Flow Rate: 80 gal/min/sf. (54 $\text{l}/\text{s}/\text{m}^2$) Minimum; ASTM D4491
6. Permittivity: 1.4 sec^{-1} minimum; ASTM D4491

7. Apparent Opening Size: 80 U.S. Std. Sieve (150 µm) maximum; ASTM D4751
8. UV-Stability: 70% retained strength; ASTM D4355 after 500 hours.

2.04 Erosion Control Blankets

Machine produced blanket with a consistent thickness of evenly distributed straw or coconut fiber as specified. Unless otherwise specified on the Plans, the erosion control blanket shall have the following minimum properties:

1. Double net 100% straw blanket
2. Top and bottom photodegradable polypropylene netting, 1.64 lbs./ 1,000 sft. (0.8 kg/ m²) approximate weight.
3. 100% agricultural straw 0.5 lbs. / sy. (.27 kg/m²)
4. Stitch spacing: 1.5 inches (40 mm) on centers

Pegs shall be 6-inch (150 mm) long, hardwood pegs.

2.05 Bonded Fiber Matrix

Bonded fiber matrix (BFM) shall consist of long strand, residual, softwood fibers joined together by a high-strength, nontoxic adhesive. The BFM shall be 100% biodegradable, and be nontoxic to fish, wildlife, and humans. Upon drying the matrix shall form a high strength, porous and erosion resistant mat that shall not inhibit the germination and growth of plants. The BFM shall retain its form despite re-wetting.

Bonded fiber matrix shall consist of:

1. Seed and Fertilizer per Section 32 9219, Seeding.
2. Wood Fiber Mulch - Thermo-mechanically defibrated long, softwood fibers manufactured from select northern softwood wood chips.
3. Polyacrylamide Binder - Site specific, fully biodegradable, polyacrylamides (PAM's) binders, with cross-linking long organic jute fibers

Materials shall be mixed at the rate of 80 lbs/acre (90 kg/Ha) of PAM binder and 2500 lbs/acre (2800 kg/Ha) of wood fiber mulch.

2.06 Inlet Filter Fabric

The filter fabric shall be constructed of 100% continuous polyester needle-punched non-woven engineering fabric. The filter fabric shall be fabricated to provide a direct fit with the drainage structure cover. The filter fabric shall have the following minimum physical properties.

1. Tensile Strength: 80 lb-f (.355 kN) minimum; ASTM D4632
2. Elongation: 50 percent minimum; ASTM D4632
3. CBR Puncture Strength: 300 lb-f minimum; ASTM D6241
4. Trapezoidal Tear: 70 lb-f (310 N) minimum; ASTM D4533
5. Flow Rate: 80 gal/min/sf. (54 l/s/m²) Minimum; ASTM D4491
6. Permittivity: 1.4 sec⁻¹ minimum; ASTM D4491
7. Apparent Opening Size: 100 U.S. Std. Sieve (150 µm) maximum; ASTM D4751
8. UV-Stability: 70% retained strength; ASTM D4355 after 500 hours.

2.07 Acceptable Manufacturers

Acceptable manufacturers include the following:

1. Tubidity Barrier: Tough Guy Type II by Aer-flo Canvas Products, Inc.
2. Wood Fiber Mulch: EcoFibre by Canfor Corporation.
3. Polyacrylamide Binder: HydroTurboNet by Straw Net, Inc.

Part 3 Execution

3.01 Examination

Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to the greatest extent possible.

Except in areas to be cleared, do not remove, cut, deface, injure or destroy trees or shrubs without the ENGINEER's approval. Protect existing trees or shrubs that are to remain and which may be injured, bruised, defaced, or otherwise damaged by construction operations, with suitable fences or other means as approved by the ENGINEER.

3.02 Preparation

Schedule work so that the soil surfaces are left exposed for the minimum amount of time. Place permanent soil and sedimentation control measures as soon as practical.

3.03 General

Do not discharge excavation ground water to the sanitary sewer, storm sewer, or to rivers, streams, etc. without authorization from the agency having jurisdiction. Construction site runoff will be prevented from entering any storm drain, river, stream, etc. directly by the use of silt fences or other suitable methods. CONTRACTOR shall provide erosion protection of surrounding soils.

Sedimentation control devices shall be installed prior to CONTRACTOR beginning Work. All Soil Erosion and Sedimentation Control Devices shall be maintained in an effective functioning condition at all times during the course of the Work.

Immediately bring earthwork to final grade and protect sideslopes and backslopes from erosion. Plan and conduct earthwork to minimize duration of exposure of unprotected soils.

3.04 Dust Control

Keep dust down at all times, including during non-working periods. Sprinkle or treat, with dust suppressants, the soil at the site, haul roads, and other areas disturbed by operations. Dry power brooming is not permitted.

3.05 Installation - General

Install silt fences, ditch sediment traps, check dams, inlet filters, temporary gravel construction entrance/exits, turbidity barriers, erosion control blankets and other soil erosion control devices as detailed on the plans. Maintain devices until permanent control measures are completed and effectively established. Remove temporary control devices after permanent measure are established. Remove and replace temporary control devices if they become ineffective at no additional cost to the OWNER.

Install temporary erosion and sedimentation control devices per the manufacturer's recommendations. Advise ENGINEER of any discrepancies between the manufacturer's recommendations and the details on the plans and install per ENGINEER's resolution of discrepancy.

3.06 Maintenance

Inspect preventative measures a minimum of once per week and within a minimum of 24 hours after every rainfall. Any soil erosion control measures damaged or rendered ineffective shall be immediately repaired or removed and replaced at no additional cost.

3.07 Installation of Erosion Control Blankets

Erosion control blankets shall be pegged at the pattern and rate as recommended by the manufacturer, however, at a minimum, blankets shall be pegged at the rate of 1.75 pegs per square yard (2pegs/m²) of blanket, unless otherwise indicated on the plans.

3.08 Application of Bonded Fiber Matrix

The slope shall be prepared and graded prior to application of bonded fiber matrix (BFM). Mixture of wood fiber mulch and polyacrylamide binder shall be blended, with the appropriate amount of seed and fertilizer per Section 32 9219, Seeding, according to manufacturer's recommendations.

The BFM shall be hydraulically applied to the soil as a viscous mixture, creating a continuous, three-dimensional blanket that adheres to the soil surface. The BFM shall be mixed and

applied at the rate as specified in Article 2.06 unless otherwise indicated on the Plans. The resulting coverage must be at least 1/8 inch (3 mm) thick over the entire surface area. The BFM shall be applied in two applications from alternate directions to eliminate shadowing, and shall be applied when no rain is expected for 12 hours.

3.09 Dewatering Discharge

Should it be necessary for the CONTRACTOR to do any dewatering during the course of construction, the CONTRACTOR shall filter all discharge through a discharge filter bag or other sediment control device that will filter all discharge water. No dewatering discharge shall be allowed to flow unfiltered from the construction site.

3.10 Project Completion

Remove all temporary soil erosion and sedimentation control devices as soon as the permanent measures have been established.

End of Section

Section 01 6000 Product Requirements

Part 1 General

1.01 Transportation and Handling

The CONTRACTOR shall provide for expeditious transportation and delivery of materials and equipment to the Project site in an undamaged condition and on a schedule to avoid delay of the Work. Materials and equipment shall be delivered in original containers or packaging with identifying labels intact and legible.

The CONTRACTOR shall provide equipment and personnel at the site to unload and handle materials and equipment in a manner to avoid damage. Materials and equipment shall be handled only at designated lifting points by methods to prevent bending or overstressing.

1.02 Storage and Protection

The CONTRACTOR shall store materials and equipment immediately on delivery, and protect it until installed in the Work.

Products subject to damage by elements shall be stored in weather-tight enclosures with temperature and humidity ranges as required by manufacturer's instructions.

Loose granular materials shall be stored on solid surfaces to prevent mixing with foreign matter.

The place of storage shall be located so as to minimize interference with traffic and to provide easy access for inspection. No material shall be stored closer than five (5) feet (1.5 m) to the edge of a pavement or traveled way open to the public.

Materials that have been stored shall be subject to retest and shall meet the requirements of their respective specifications at the time they are to be used in the Work.

The CONTRACTOR shall provide protection of stored or installed materials and equipment as necessary to prevent damage from traffic and subsequent operations.

1.03 Manufacturer's Instructions

When the Contract Documents require that installation of Work shall comply with manufacturer's instructions, the CONTRACTOR shall obtain and distribute copies of such instructions to parties involved in the installation including two (2) copies to the ENGINEER. The CONTRACTOR shall handle, install, connect, clean, condition and adjust products in strict accord with such instructions and in conformity with specified requirements. Should Project conditions or specified requirements conflict with manufacturer's instructions, consult with ENGINEER for further instructions.

1.04 Products List

Within four (4) days of request, the CONTRACTOR shall submit a complete list of major products proposed to be used, with the name of the manufacturer and the installing subcontractor, if applicable, to the ENGINEER.

1.05 CONTRACTOR's Product Options

For products specified only by reference standard, the CONTRACTOR shall select any product meeting that standard.

For products specified by naming several products or manufacturer's the CONTRACTOR shall select any one of the products or manufacturers named, which complies with the specifications.

For products specified by naming one or more products or manufacturers and "or equal," the CONTRACTOR must submit a Substitution Request Form for any product or manufacturer not specifically named, in accordance with the General Conditions.

For products specified by naming only one product and manufacturer, there is no option.

1.06 Equipment Startup and Testing

The CONTRACTOR shall perform a comprehensive startup and demonstration of equipment performance and compliance with the

design requirements. When there is more than one mode of operation, the equipment shall be operated in every mode to verify proper operation.

When equipment is to operate in conjunction with other equipment as a system, each piece of equipment shall be operated both by itself and automatically as a system to verify its proper operation.

CONTRACTOR is to provide to ENGINEER, in advance of startup, a schedule and listing of startup and testing procedures for review by ENGINEER. Checklists and diagrams may be required to ensure adequate startup and testing. The ENGINEER may recommend changes to the startup procedure as necessary.

All equipment is to be inspected prior to operation for debris or other obstructions. Equipment is to be properly lubricated and calibrated prior to operation. CONTRACTOR shall make all adjustments necessary to assure correct operation. When required, equipment installation and operation is to be witnessed and checked by manufacturer.

When required, the CONTRACTOR shall train OWNER's operation and maintenance personnel in the proper operation and maintenance of each piece of equipment and the system as a whole.

All equipment startup is to be witnessed by the OWNER and ENGINEER.

Part 2 Products (Not Used)

Part 3 Execution (Not Used)

End of Section

Section 01 7123 Construction Layout

Part 1 General

1.01 Responsibility for Staking

The OWNER will set stakes and markers showing the locations on the surface of various parts of the Work as outlined herein. Any additional stakes shall be provided at the expense of the CONTRACTOR. The CONTRACTOR shall furnish such labor and assistance as the OWNER may require in setting the same. It shall be the responsibility of the CONTRACTOR to transfer surface line and grade to the bottom of any tunnel or to the bottom of any other subsurface operations where ordinary surface line and grade is not feasible.

The CONTRACTOR shall utilize lasers, or surveying instruments run by qualified competent personnel to control the construction installation Work. If the method being used by the CONTRACTOR fails to give proper alignment and grade control to the Work, the OWNER shall be empowered to order the CONTRACTOR to use such other method(s) as will provide adequate control.

The ENGINEER may require the CONTRACTOR, at the CONTRACTOR's expense, to provide such masts, scaffolds, batter-boards, straightedges, templates, or other devices as may be necessary to facilitate laying out, observing and constructing the Work.

1.02 Staking Schedule

The CONTRACTOR shall submit a completed staking schedule on the form provided by the ENGINEER showing the order in which the CONTRACTOR proposes to conduct the construction operation prior to the preconstruction meeting. The schedule shall be submitted to the ENGINEER a minimum of three (3) working days prior to the start of construction.

During construction, the CONTRACTOR shall to the extent possible, limit unnecessary staking requests and coordinate his construction schedule to provide for the efficient and effective use of the

survey crew and eliminate excessive survey crew trips to the site.

1.03 Line and Grade

The CONTRACTOR shall request, three (3) working days in advance, from the ENGINEER additional line and grade stakes as the CONTRACTOR may reasonably protect and preserve. Such request by the CONTRACTOR shall be on a staking request form.

1.04 Relocation and Re-Establishment

A. Construction Stakes

Where change of location of stakes has been requested by the CONTRACTOR, or where the CONTRACTOR fails to properly preserve construction survey stakes, such resetting or relocations of stakes shall be done by the ENGINEER and paid for by the CONTRACTOR on the basis of time and materials for such restaking.

B. Survey Control Points

The CONTRACTOR shall bear all expense involved in re-establishing and/or resetting any survey control point, land survey point or monument lost or disturbed during his construction operation. Such Work shall be done under the direct supervision of a licensed land surveyor. Such survey control points shall be marked and flagged by the ENGINEER prior to construction.

1.05 Staking Pipelines Laid to Grade

One (1) staking: Line and grade points at each structure and at not less than 100-foot (30 m) intervals, with benchmarks at maximum 1/4 mile (400 m) intervals.

1.06 Staking Pipelines Not Laid to Grade

One (1) staking: Line points at each structure with 100-foot (30 m) intermediate line points.

1.07 Staking Tunnels

First staking: Line and grade to sink the shaft.

Second staking: Line and grade on top of the shaft prior to tunneling.

1.08 Staking Bores

One (1) staking: Line and grade points at each end.

1.09 Staking Existing Drainage

Unless otherwise indicated on the Plans or specified herein, the CONTRACTOR shall bear all expenses including the staking of line and grade required to restore proper grading of surface drainage, including swales and ditches disturbed during the construction operation.

1.10 Staking Earth Work

A. Parks, Parking Lots, or Site Improvement

First staking: Line points at 300-foot (100 m) intervals for clearing and grubbing.

Second staking: Final grade points on 100-foot (30 m) grid and grade changes.

B. Site Improvement Paving

First staking: Line points at 300-foot (100 m) intervals for clearing and grubbing.

Second staking: Final grade points at 50-foot (20 m) intervals on centerline, perimeter and at grade changes.

C. Ponds

First staking: Line points at 300-foot (100 m) intervals for clearing and grubbing.

Second staking: Perimeter dike or bank alignment points offset at corners with two (2) benchmarks on site.

1.11 Staking Open Drains

A. New Drain Improvements

First staking: Line points at 300-foot (100 m) intervals and angle points for clearing and grubbing.

Second staking: Line and grade points at 100-foot (30 m) intervals, angle points, grade changes, and structures.

B. Drain Cleanouts

One (1) staking of grade points at 300-foot (100 m) intervals, angle points, grade changes, and structures.

1.12 Staking Roadway Without Curb and Gutter

One (1) staking: Line and grade points for road centerline finish surface at 50-foot (20 m) intervals and at grade changes, points of curve and at 25-foot (10 m) intervals on curves.

1.13 Staking Roadway With Curb and Gutter

One (1) staking: Line and grade points for top of curb at 50-foot (20 m) intervals and at grade changes, points of curve and at 25-foot (10 m) intervals on curves.

1.14 Staking Buildings and Structures

One (1) staking: Two (2) intersecting base lines and a minimum of two benchmarks on the site.

Two (2) benchmarks each side of watercourse to be provided for bridges.

Part 2 Products (Not Used)

Part 3 Execution (Not Used)

End of Section

Section 01 7700 Closeout Procedures

Part 1 General

1.01 Cleaning

The CONTRACTOR shall perform periodic cleaning to keep the Work, the site and adjacent properties free from accumulations of waste materials, rubbish and wind-blown debris, resulting from construction operations. Waste material, debris and rubbish shall be periodically removed from the site and disposed of at legal disposal areas away from the site. Prior to OWNER acceptance the CONTRACTOR shall conduct an inspection of sight-exposed interior and exterior surfaces, and all Work areas, to verify that the entire Work is clean. CONTRACTOR shall broom clean exterior paved surfaces and rake clean other exterior surfaces of the site.

1.02 Project Record Documents

The CONTRACTOR shall deliver one (1) copy of all Specifications, Plans, Addenda, Shop Drawings and Samples, annotated to show all changes made during the construction process, to the ENGINEER upon completion of the Work. Submittal of the record documents shall be made with a transmittal letter containing:

- Date
- Project Title and Number
- CONTRACTOR's Name and Address
- Title and Number of each Record Document
- Certification that each Document as submitted is complete and accurate

Documents shall be submitted in good order and in a legible condition.

1.03 Operation and Maintenance Data

Prior to final inspection or acceptance, the CONTRACTOR shall fully instruct OWNER's designated operating and maintenance personnel

in the operation, adjustment and maintenance of all products, equipment and systems specified. Operation and maintenance data required by the individual Specification sections and the manufacturer's operation and maintenance data required in Section 01 3300, Submittal Procedures, shall constitute the basis of such instruction.

1.04 Start Up

The CONTRACTOR shall coordinate efforts between the OWNER, ENGINEER, any equipment manufacturers, subcontractors and governing agencies in the startup of applicable portions of the Work.

1.05 Substantial Completion

Certification that the Work is substantially complete shall be in accordance with the General Conditions.

1.06 Final Payment and Acceptance

The final inspection, final application for payment and acceptance shall be in accordance with the General Conditions.

Part 2 Products (Not Used)

Part 3 Execution (Not Used)

End of Section

Section 01 8900

Site Construction Performance Requirements

Part 1 General

1.01 Scope

This Section includes general performance requirements for earthwork complete with, reimbursement for crop damage, removal and disposal of structures and obstructions, protection of existing sewers, tiles and mains; protection of existing building and improvements, protection of trees and other types of vegetation, protection of utility lines, requirements for pavement replacement, restoration of driveways and parking areas, restoration of sidewalks, restoration of lawns and disturbed areas, transportation, and disposal of excess excavation.

1.02 Related Work Specified Elsewhere

1. Temporary Erosion and Sediment Control: Section 01 5713
2. Grading: Section 31 2200
3. Subgrade Preparation: Section 31 2313
4. Structural Excavation and Backfill: Section 31 2316
5. Dewatering: Section 31 2319
7. Trenching and Backfilling: Section 31 2333
8. Bituminous Paving: Section 32 1216
9. Concrete Paving: Section 32 1313
10. Sidewalks and Driveways: Section 32 1315
11. Seeding: Section 32 9219
12. Sodding: Section 32 9223

1.03 Reference Standards

Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications:

MDOT - Michigan Department of Transportation
Standard Specifications for
Construction, latest edition.

1.04 Requirements of Regulatory Agencies

CONTRACTOR shall comply with Section 01 5713, Temporary Erosion and Sediment Control. The CONTRACTOR, at his expense, shall secure all permits, and post all bonds or deposits required to comply with the "Soil Erosion and Sedimentation Control," requirements, being Part 91 of PA 451 of 1994 as amended.

CONTRACTOR shall comply with all requirements of the National Pollutant Discharge Elimination System (NPDES) Storm Water Program for Construction Activities, Part 31 of PA 451 of 1994 as amended.

The CONTRACTOR shall provide, maintain and remove such temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or as determined by the ENGINEER. The measures shall prevent surface runoff from carrying excavated materials into the waterways, to reduce erosion of the slopes, and to prevent silting in of waterways downstream of the Work. Also, the measures should include provisions to reduce erosion by the wind of all areas stripped of vegetation, including material stockpiles.

1.05 Submittals

Written permission for the use of all disposal and borrow sites shall be obtained and copies shall be furnished to the ENGINEER.

1.06 Protection of Plant Life

All trees, shrubs, and other types of vegetation not within the limits of the Work or not designated on the Plans or by the ENGINEER to be removed, shall be carefully protected from damage or injury during the various construction operations. Any tree, shrub or other type of vegetation not designated to be removed but which is damaged by the CONTRACTOR's operation shall be repaired

or replaced by the CONTRACTOR, at his expense, as determined by the ENGINEER.

1.07 Protection of Existing Structures and Improvements

All existing culverts, sewers, drainage structures, manholes, water gate wells, hydrants, water mains, utility poles, overhead lines, underground conduits, underground cables, pavement, or other types of improvements within the construction limits, not designated on the Plans to be removed, shall be carefully protected from damage during the construction operations. Any existing structure or improvement not designated to be removed, but which is damaged by the CONTRACTOR's operations shall be repaired or replaced by the CONTRACTOR, to the satisfaction of the owner, at his expense.

Any deposits of dirt or debris in sewers, culverts, tiles, drainage structures, manholes, gate wells, etc. caused by the CONTRACTOR shall be cleaned out at the CONTRACTOR's expense.

1.08 Maintaining Drainage

All existing open drains, field and roadway ditches, drainage tile, sewers, enclosed drains, natural and artificial watercourses, surface drainage or any other types of drainage within the limits of the Work shall be maintained and free to discharge during construction. Any drainage facility not designated to be abandoned, but which is damaged, or any drainage interrupted by the CONTRACTOR's operation shall be immediately repaired, replaced, or cleared by the CONTRACTOR. All costs incurred shall be incidental to the excavating, backfilling and compacting or grading operations.

Part 2 Products

2.01 Granular Material

Bank run sand meeting the requirements of MDOT, Granular Material Class II.

2.02 Aggregate for Shoulders, Parking Areas, Driveways or Roads

Crushed Limestone, Natural Aggregate or Slag and meeting the requirements of MDOT Section 902.

Part 3 Execution

3.01 Dewatering

The area within the vicinity of the new Work shall be dewatered prior to commencing any construction activities. The depth of the dewatering shall be sufficient to allow the Work area to remain in a dry condition during the various construction operations. The costs incurred for furnishing, installing, maintaining and removing the dewatering equipment shall be at the CONTRACTOR's expense. Refer to Section 31 2319, Dewatering, for additional requirements.

3.02 General

The various construction operations shall be restricted to the existing right-of-way or the areas indicated on the Plans. If the CONTRACTOR requires additional area, the CONTRACTOR shall furnish the ENGINEER with written permission obtained from the property owner for any part of the operations he conducts outside of the right-of-way or limits indicated.

3.03 Existing Improvements

The CONTRACTOR shall expose existing sewers and structures to which the new Work is to be connected and notify the ENGINEER of same. The ENGINEER will verify the vertical and horizontal locations of the existing system and shall inform the CONTRACTOR as to the necessary adjustments required to align the new Work with the existing system.

3.04 Existing Utilities

When existing utilities are shown on the Plans, their locations are approximate only, as secured in the field investigation and/or from available public records. The CONTRACTOR, prior to the start of construction, shall contact Miss Dig and the public agency or utility having jurisdiction to request the verification of all utilities within the construction area.

When existing utility lines, structures or utility poles are encountered during the performance of the Work, the CONTRACTOR, at his expense, shall perform his operations in such a manner that the service will be uninterrupted.

The CONTRACTOR shall expose all existing utility lines prior to any excavation operation, to determine any conflict with the proposed improvement. The CONTRACTOR shall be responsible for any relocation required as a result of any conflict of existing utilities shown on the plans, with the proposed improvement.

Should it become necessary to move any utility structure, line or pole shown on the Plans or otherwise found necessary to be moved, the CONTRACTOR shall make all arrangements with the OWNER of the utility for the moving. All costs incurred for such moving shall be at the CONTRACTOR's expense unless indicated otherwise. However, before disturbing a utility line, structure or pole, the CONTRACTOR shall furnish the ENGINEER with satisfactory evidence, in writing, that proper arrangements have been made with the Owner of the utility.

3.05 Utility Poles

The CONTRACTOR shall be responsible for any removal or relocation required as a result of any conflict of existing utility poles (including street light poles, guy poles, telephone poles, etc.) with proposed improvements.

The CONTRACTOR shall make all arrangements for removing or relocating utility poles with the owner of the utility pole.

Prior to disturbing any utility pole, the CONTRACTOR shall provide the ENGINEER with written evidence that proper arrangements have been made with the owner of the utility pole.

When required by the Work, CONTRACTOR shall temporarily support poles in the vicinity of the Work at no additional cost to the OWNER. Support shall be in accordance with and to the satisfaction of the utility company.

3.06 Existing Sewers, Tile, and Mains

Existing sanitary sewers, storm sewers, drain tile, septic tank bed tiles, water mains or building services or leads, that are encountered during the

performance of the Work that require relocation or are damaged, shall be restored with new materials equal in quality and type to the materials encountered.

The new material shall be installed as specified in the Contract Documents and per the requirements of the local agencies. The bedding and backfill material, unless otherwise specified, shall be an approved Class II granular material, compacted to 95% of its maximum unit weight.

Seepage bed tile and water mains shall be replaced in accordance with the requirement of the agency having jurisdiction.

The relocation or protection of existing sewers, tiles, tile field, water mains or building services and leads shall be at the CONTRACTOR's expense, unless otherwise indicated in the Contract Documents.

3.07 Existing Structures

Existing surface and subsurface structures may be shown on the Plans, in locations considered most probable from information secured in the field investigation or from available public records. Neither the correctness nor completeness of such information is guaranteed or implied. All structures shall be protected, preserved or restored by the CONTRACTOR, to the satisfaction of the structure owner, at no additional cost to the Project.

3.08 Existing Buildings

Existing buildings or structures may be encountered throughout the Project within limits of the presently established right-of-way or easement. Good construction methods and procedures shall be employed by the CONTRACTOR, at his expense, to protect the structures.

When it becomes necessary for the CONTRACTOR to move one of these buildings or structures in order to proceed with construction, the CONTRACTOR, at his expense, shall exercise all due care in moving the building or structure to prevent undue damage. Prior to moving an existing building or structure, the CONTRACTOR shall furnish the ENGINEER with satisfactory evidence, in writing, that proper arrangements have been made with the owner.

Unless otherwise specified in the Contract Documents, the length of the move shall be maintained to a minimum which will allow for construction of the improvement.

3.09 Removal of Sewers and Culverts

Unless otherwise specified in the Contract Documents, the CONTRACTOR, at his expense, shall remove any abandoned culvert, pipe, sewer, structure or part of a structure which is to be replaced or rendered useless by the new construction. When a sewer or culvert is removed at a structure, the CONTRACTOR shall install a masonry bulkhead in the structure. Removal of a culvert or sewer also includes the removal and disposal of any end treatments or headwalls.

3.10 Removal of Structures

The removal of existing structures shall consist of removing and salvaging the existing frame and cover. The ends of the existing pipe shall be plugged and braced. The complete structure shall be removed entirely and disposed of. The excavation shall be backfilled with sand and compacted to 95 percent of its maximum unit weight. Maximum unit weight shall be determined by ASTM D698, Method B.

If a structure is to be removed from a system that is to remain in service, a bypass system, approved by the ENGINEER, shall be installed and maintained by the CONTRACTOR, during the rebuilding period.

3.11 Abandoning Structures

The structure shall be broken down to at least 30 inches (750 mm) below the subgrade. All pipes connected to the structure shall be plugged with a brick, masonry or concrete bulkhead approved by the ENGINEER. The structure shall be backfilled with flowable fill to 1-foot (300 mm) above the pipes and the remainder of the structure backfilled with sand-cement mixture at a 10 to 1 ratio to subgrade elevation or to 1-foot (300 mm) below finished grade. The remainder of the excavation shall be backfilled with a granular material, compacted to 95% of its unit weight, and shall meet with the approval of the ENGINEER.

Maximum unit weight shall be determined by ASTM D698, Method B.

3.12 Salvaged Material

Salvaged materials shall become the property of the CONTRACTOR unless otherwise specified in the Contract Documents, and shall be disposed of by the CONTRACTOR, at his expense.

3.13 Crop Damage

In areas where crops are encountered along the route of the construction, a written agreement shall be arrived at by the CONTRACTOR and the crop owner as to the type and nature of the crop concerned prior to any construction within the area.

The CONTRACTOR shall be responsible for making full reimbursement to the owner of the crop damage on the basis of the following procedure:

1. The area of the crop damage shall be determined by measurements taken by the ENGINEER, and this area shall include those portions of the crop which may extend into the public right-of-way.
2. The average yield of the crop shall be established by the County Office of the U.S. Agricultural Extension Service.
3. The cost of the crop shall be determined by using the prevailing price at the time of harvest as furnished by the U.S. Agricultural Extension Service.

The CONTRACTOR shall furnish the ENGINEER with satisfactory evidence that payment for crop damage was made, prior to receiving final payment on the Project.

3.14 Trees

All trees excepting those specified on the Plans to be removed, shall be effectively protected by the CONTRACTOR during his construction operations. If in the opinion of the ENGINEER, the methods of protection employed by the CONTRACTOR are not adequate, the CONTRACTOR shall carry on his operation by tunneling, or by other approved means, which will

not cause undue damage to the trees. The requirements for tree tunneling are as follows:

1. Depth of Cover

Tunnels shall be placed at a minimum depth of 30 inches (0.75 m), measured from the ground surface to the top of the tunnel.

2. Length of Tunnel

Tunnel length in feet (meters) shall be in direct proportion to diameter of tree in inches (millimeters) for trees eight (8) inches (200 mm) or larger in diameter. One (1) foot of tunnel shall be constructed for each inch of tree diameter whenever the trench or any portion thereof approaches the tree trunk a distance in feet equal to one-half the tree diameter in inches. (Or one (1) meter of tunnel shall be constructed for every one hundred millimeters (100 mm) of tree diameter whenever any portion of the trench approaches the tree trunk a distance in meters equal to 1/200 of the tree diameter in millimeters).

Example: A tree 12 inches in diameter shall require a 12-foot tunnel whenever the trench or any portion thereof approaches within six (6) feet of said tree. (A tree 300 mm in diameter shall require a 3 m tunnel whenever any portion of the trench approaches within 1.5m of the tree trunk).

3. Measurements

Trees under eight inches (200 mm) in diameter will require the same length of tunnel as 8-inch (200 mm) trees. Measurements of tree diameters shall be taken four (4) feet (1 m) above the ground surface.

Where the Plans indicate areas allowing the cutting of minor trees, care should be used to keep damage to adjacent trees to an absolute minimum. Where these areas are specifically indicated on the Plan, they are to be cleared and all trunks and branches shall be disposed of by the CONTRACTOR. Debris shall not be bulldozed on to adjacent private property.

Trees damaged by the construction operation shall be repaired so not to inhibit growth or replaced at the expense of the CONTRACTOR. Repair or replacement shall be contingent upon agreement between the damaged tree OWNER and CONTRACTOR. In any event, limbs, branches and roots damaged by the CONTRACTOR shall be

properly pruned to the satisfaction of the ENGINEER.

Costs incurred for protection of trees, including tunneling, repair and replacement, if necessary, shall be at the CONTRACTOR's expense.

3.15 Remove and Replace Tree

Tree removal and replacement may be accomplished in two ways.

- 1) The CONTRACTOR may completely remove and dispose of the existing trees, and after the new improvement has been completed, tested, accepted and rough grading has been completed, the CONTRACTOR shall plant new trees, in approximately the same location as the existing trees, of size and species per the following (existing trees to be replaced with like specie):

“Acer Rubrum” October Glory Red Maple, 2 ½-inch (65 mm) B&B (min)

“Malus Centzam” Centzam Crabapple, 2-inch (50 mm) B&B (min)

“Crataegus Phaenaopyrum” Washington Hawthorn, 8-foot (2.4 m) B&B (min)

“Pinus Nigra” Austrian Pine, 6-foot (1.8m) B&B (min)

“Picea Pungens” Colorado Spruce, 5-foot (1.5 m) B&B (min)

“Quercus Rubra” Red Oak, 2 ½-inch (65 mm) B&B (min)

“Pyrus Calleryana” Redspire Pear, 2-inch (50 mm) B&B (min)

- 2) The CONTRACTOR may remove and preserve the existing trees. The trees shall be properly cared for and maintained in a healthy condition. After the new improvement has been installed, tested, accepted and rough grading completed, the trees shall be replanted in approximately the same location. Any trees damaged, destroyed or which die, shall be replaced at no additional cost.

All trees, whether replanted or planted new, shall be guaranteed for a period of two years from the date of substantial completion.

3.16 Removing Pavement

The removal of concrete and bituminous pavement as called for on the Plans shall consist of removing and disposing of pavement and shall include base courses, surface courses, integral and separate curbs, integral and separate curb and gutters, sidewalks and end headers.

The pavement shall be removed to an existing joint or cut parallel to the existing pavement joints. The cutting shall be accomplished by using a power-driven concrete saw approved by the ENGINEER. The depth of the saw cut shall be a minimum of six (6) inches (150 mm), to insure that the removal of the old pavement will not disturb or damage the section of pavement remaining in place.

Residual concrete pavement shall not be less than five feet (1.5 m) measured transversely, nor less than six feet (1.8 m) longitudinally measured from a joint.

In removing a concrete base course, where part of the existing bituminous surface is to remain in place, the bituminous surface shall be cut the full depth by the use of a power-driven saw, approved by the ENGINEER along a line parallel to and at least one foot (300 mm) from either side of the base course removal.

Old pavement with a concrete cap shall be considered as only one (1) pavement, whether or not there is a separation layer of earth, aggregate, or bituminous material between the old material and the concrete cap.

A. Removal of Curb for Curb Drop

Where curb is to be removed for a curb drop, the operation shall be performed by saw cutting or by cold milling, approved by the ENGINEER, so as to leave a neat surface with a maximum 1-inch lip, without damage to the underlying pavement.

B. Removal of Curb and Gutter

Where curb and gutter are to be removed, the operation shall be performed by saw cutting. The limits of the removal shall be as called for on the Plans, or as approved by the ENGINEER. However, in no case shall the width of removal be less than 18 inches (450 mm) for sections with rolled or straight curb or less than 24 inches (600 mm) for mountable curbs.

If during the pavement removal operation any concrete or bituminous pavement or surfacing is damaged beyond the removal limits designated, the damaged pavement or surfacing shall be removed and replaced at the CONTRACTOR's expense.

Any earth which may be removed during the pavement removal operation shall be replaced by backfilling to the proposed subgrade with a suitable material, approved by the ENGINEER, at the CONTRACTOR's expense.

3.17 Guardrail

Beam guardrail shall be relocated or shall be removed as specified on the Plans or as determined by the ENGINEER. If any of the existing material is damaged or destroyed, the CONTRACTOR shall replace the material at his expense.

Where guardrail is encountered during construction, and its removal was not called for on the Plans, it shall be replaced or restored, at the CONTRACTOR's expense, to a condition comparable to that prior to construction.

After the guardrail removal or relocation operations are complete, all surplus material shall be removed and disposed of by the CONTRACTOR, at his expense, unless otherwise called for in the Contract Documents.

Any holes or voids resulting from the guardrail removal operation shall be backfilled with a Class II granular material, approved by the ENGINEER.

3.18 Fences

Fences shall be removed and replaced or shall be removed as indicated on the Plans. If any of the existing material is damaged or destroyed, the CONTRACTOR shall replace the material at his expense.

Where fencing is encountered during construction, and its removal was not called for on the Plans, it shall be replaced or restored, at the CONTRACTOR's expense, to a condition comparable to that prior to construction.

After the fence removal or relocation operations are complete, all surplus material shall be removed and disposed of by the CONTRACTOR, at his expense, unless otherwise called for in the Contract Documents.

Any holes or voids resulting from the fence removal operation shall be backfilled with a suitable material, approved by the ENGINEER.

Where fences are encountered that are being used to confine livestock or to provide security, the fence shall be immediately replaced following construction. During construction, the CONTRACTOR, at his expense, shall provide, install and maintain a temporary fence, meeting the approval of the ENGINEER.

3.19 Holes

Earth removed during any phase of the excavation or removal operations, resulting in a hole or void, shall be replaced by backfilling to the proposed subgrade with a suitable granular material. The material shall be placed by the controlled density method or other effective means having the approval of the ENGINEER and shall be compacted to 95% of maximum unit weight.

The furnishing, placing and compacting of the backfill material shall be at the CONTRACTOR's expense.

3.20 Restoration in Right-of-Way and Yard Areas

The right-of-way and yard areas not paved or aggregate surfaced shall be restored in accordance with the type and location specified herein unless indicated otherwise on the Plans. The disturbed areas may be shaped by "Machine Grading" or another method approved by the ENGINEER to achieve the cross section, line and grade shown on the Plans. Areas where slopes are 1 on 4 or flatter shall be restored with topsoil, seed and mulch. Slopes steeper than 1 on 4 shall be restored with sod.

Any excess material from the restoration operation shall be disposed of by the CONTRACTOR at his expense.

The disturbed areas shall be graded to receive either topsoil and seed or topsoil and sod. The topsoil, seed, sod, fertilizer and mulch shall conform to the requirements specified on the Plans and in Section 32 9219, Seeding, or Section 32 9223, Sodding.

The CONTRACTOR, at his expense, shall furnish, place, and compact any additional fill, meeting the approval of the ENGINEER, needed to restore the disturbed areas to the cross sections called for on the Plans or as determined by the ENGINEER.

3.21 Restoration of Aggregate Surfaces

A. Shoulders

The shoulder shall be regarded as the area between the edge of pavement and the ditch, or the area within ten (10) feet (3 m) of the pavement, whichever is the lesser.

The backfilling of trenches in the shoulder area shall be carried to within five (5) inches (125 mm) of the existing surface as specified under Trench "A" or Trench "B." The remaining depth shall be backfilled with a minimum of five inches (125 mm) of compacted 22A or 23A aggregate with calcium chloride applied, at the rate of six (6) pounds per Ton of aggregate (3 kg per metric ton of aggregate).

The CONTRACTOR, at his expense, shall furnish, place and compact all materials necessary to complete the backfilling and restoration operation within the shoulder area.

B. Driveways and Parking Areas

Aggregate driveway areas shall be regarded as the area from the right-of-way line to the edge of the traveled roadway and shall include the shoulder area.

The backfilling of trenches crossing aggregate surfaced driveways and parking areas shall be carried to the bottom of the proposed base course as specified under Trench "B". The

remaining depth shall be backfilled with a minimum of six inches (150 mm) of compacted 22A or 23A aggregate, with calcium chloride applied at the rate of six (6) pounds per Ton of aggregate (3 kg per 1000 kg of aggregate).

Any aggregate surfaced areas beyond the limits of the actual excavation which are disturbed, as determined by the ENGINEER, by such operations as temporary storage of materials or passage of equipment, shall be resurfaced, at the CONTRACTOR's expense. The upper three (3) inches (75 mm) of disturbed areas shall be removed as necessary to allow the final elevation of the resurfacing course to be at the elevation of the drive or parking area which existed prior to excavation.

The disturbed area shall be resurfaced with a minimum of three (3) inches (75 mm) of compacted 22A or 23A aggregate, with calcium chloride applied at the rate of six (6) pounds per Ton of aggregate (3 kg per metric ton of aggregate).

The CONTRACTOR, at his expense, shall furnish, place, and compact all materials necessary to complete the backfilling and restoration operations within the driveway and parking area.

C. Roads and Streets

Backfilling of trenches crossing aggregate surfaced roads or streets shall be carried to within 12 inches (300 mm) of the existing surface as specified under Trench "B." The remaining depth shall be backfilled with two 6-inch (150 mm) layers of compacted 22A or 23A aggregate, with calcium chloride applied at the rate of six (6) pounds per Ton of aggregate (3 kg per metric ton of aggregate).

The CONTRACTOR, at his expense, shall furnish, place, and compact all materials necessary to complete the backfilling and restoration operations within the roadway or street area.

Also, any settlement of the aggregate surface shall be restored by placing additional aggregate, up to the original grade, and shall be done at the CONTRACTOR's expense.

D. Compaction

The compaction of all aggregate shall be performed by a pneumatic-tired roller or a vibratory compactor until the material forms a stable surface.

3.22 Restoration of Paved Surfaces

The CONTRACTOR, at his expense, shall provide the materials necessary to complete the backfilling and restoration operations, which shall include furnishing, compacting, forming, placing, rolling, floating, jointing, finishing, curing and providing protection against elements.

Restoration of any roadways that are partially damaged shall include a minimum replacement of one (1), full width lane of roadway. The length of replacement shall be at least equal to the width.

A. Concrete

The backfilling of trenches crossing concrete driveways, sidewalks, roads, streets or parking areas shall be carried to the bottom of the proposed pavement as specified under Trench "B"

Unless otherwise specified on the Plans or as determined by the ENGINEER, the concrete removed shall be replaced with 3,500 psi (24 MPa) concrete of the thickness removed and shall include reinforcing equal to the existing, if the existing pavement was reinforced. The construction of concrete pavements shall be in accordance with Section 32 1313, Concrete Paving.

Restoration of sidewalks shall also include the construction of sidewalk ramps at the intersection of the curb and shall conform to the current rules and regulations of Act 8, Michigan PA 1973, as amended and to Section 32 1315, Sidewalks and Driveways, and unless otherwise indicated in the Proposal, shall be considered incidental to the Project.

B. Bituminous

The backfilling of trenches crossing bituminous driveways, sidewalks, roads, streets or parking areas shall be carried to the

bottom of the base course as specified under Trench "B."

The bituminous pavement or bituminous surface course with an aggregate base shall be replaced in accordance with Section 32 1216, Bituminous Paving.

Bituminous surfaced areas beyond the limits of the actual excavation which are disturbed by such operations, as temporary storage of materials or passage of equipment, shall be resurfaced with an approved bituminous mixture the same thickness as removed, but in no case less than two (2) inches 50 mm) in thickness. The replacement material shall extend to smooth-cut edges, shall be uniform in direction and shall be at an elevation which provides a uniform surface between the undisturbed abutting surfaces.

Restoration of any bituminous chip seal shoulders that are damaged or partially damaged, as determined by the ENGINEER, shall include complete replacement full width and length (extending a minimum of 25 linear feet (7.6 m) beyond the damaged area both ways). Existing bituminous chip seal shoulders shall be brought to proper grade with compacted 22A or 23A aggregate and resurfaced with a double chip seal per Section 32 1216, Bituminous Paving.

3.23 Soil Erosion and Sedimentation Control

CONTRACTOR shall comply with the requirements of Section 01 5713, Temporary Erosion and Sediment Control. Prior to commencing any type of earthwork, the CONTRACTOR shall obtain a Soil Erosion and Sedimentation Control permit from the local enforcing Agency.

The CONTRACTOR, at his expense, shall obtain all approvals, secure all permits and post all bonds and deposits required to comply with the Soil Erosion and Sedimentation Control Act, Part 91 of PA 451 of 1994, as amended, and those of the enforcing agency.

The CONTRACTOR shall provide the ENGINEER with a copy of the soil erosion permit issued by the local enforcing agency for the Project, prior to commencing any type of earthwork on the Project.

3.24 Excess Excavation

Excess excavation shall be defined as all surplus earth material realized from the construction that is free of brush, roots, stumps, broken concrete, pipe, debris, and other extraneous material.

The CONTRACTOR, when requested by the OWNER, shall transport all excess excavation to a site(s) designated by the OWNER. The excess excavation shall be graded by the CONTRACTOR to provide positive surface drainage of the site(s). The grading shall be done such that adjacent properties are not damaged or affected. The grading shall include removal of all surface irregularities to provide a smooth surface (± 0.25 foot) (± 75 mm).

When the excess excavation has not been requested by the OWNER, the CONTRACTOR shall remove and properly dispose of the material at no additional cost to the OWNER.

Proper disposal of all excess excavation, including transportation, grading, and protection of adjacent properties shall be considered as a final cleanup item. No additional payment will be made for this item.

Any brush, roots, stumps, broken concrete, pipe, debris, and other extraneous material from the construction shall become the property of the CONTRACTOR, and shall be disposed of per all applicable Laws, rules or regulations. Removal and disposal of this material shall be considered as part of final cleanup. No additional payment will be made for this item.

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

End of Section

Specifications

Division 06 Wood, Plastics, and Composites

Section 06 1000

Rough Carpentry

Part 1 General

1.01 Scope of Work

- A. This Section includes all rough carpentry work including framing, nailers, blocking, wood grounds, and furring necessary for the completion of the project as indicated on the Plans. Rough carpentry includes carpentry work not specified as part of other sections and which is generally not exposed, except as otherwise indicated.

1.02 Standard References

- A. American Forest and Paper Association (AFPA):
 - 1. Manual for Wood Frame Construction
- B. American National Standards Institute (ANSI):
 - 1. A208.1 Mat-Formed Manufactured Panels
- C. Engineered Wood Association American Plywood Association (APA):
 - 1. Form E30 - Engineered Wood Design/Construction Guide: Residential and Commercial
- D. American Society of Mechanical Engineers (ASME):
 - 1. B18.2.1 - Square and Hex Bolts and Screws - Inch Series
 - 2. B18.6.1 - Wood Screws (Inch Series)
- E. American Society for Testing and Materials (ASTM):
 - 1. A153 - Specification for Zinc -Coating (Hot-Dip of Iron and Steel Hardware)
 - 2. A307 - Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
 - 3. A563 - Specification for Carbon and Alloy Steel Nuts
 - 4. A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - 5. D245 - Practice for Establishing Structural Grades and Related Allowable Properties for Visually Graded Lumber
 - 6. D2555 - Test Method for Establishing Clear Wood Strength Values
- F. American Wood Preservers Association (AWPA):
 - 1. C2 - Lumber, Pressure Treatment

2. C9 - Plywood, Pressure Treatment
3. C20 - Structural Lumber, Fire-Retardant Pressure Treatment
4. C27 - Plywood, Fire-Retardant Pressure Treatment
5. M4 - Standard for the Care of Preservative-Treated Wood Products

1.03 Submittals

- A. General: Submit the following in accordance with the conditions of Contract and Section 01 3300, Submittal Procedures.
- B. Product Data: Submit manufacturer's product data for each distinct product specified.
- C. Wood treatment data as follows, including chemical treatment manufacturer's warranty and instructions for handling, storing, installing, and finishing treated materials:
 1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
 2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.
 3. For fire-retardant-treated wood products, include certification by treating plant that treated materials comply with specified standard and other requirements as well as data relative to bending strength, stiffness, and fastener-holding capacities of treated materials.
- D. Material Certificates: Where dimensional lumber is provided to comply with minimum allowable unit stresses, submit listing of species and grade selected for each use, and submit evidence of compliance with specified requirements. Compliance may be in form of a signed copy of applicable portion of lumber producer's grading rules showing design values for selected species and grade. Design values shall be as approved by the Board of Review of American Lumber Standards Committee.

1.04 Quality Assurance

- A. Single-Source Responsibility for Fire-Retardant-Treated Wood: Obtain each type of fire-retardant-treated wood product from one source and by single producer.

1.05 Delivery, Storage, and Handling

- A. Deliver wood products bundled or crated to provide adequate protection during transit and job storage, with required grade marks clearly identifiable. Inspect wood products for damage upon delivery. Remove and replace damaged materials.
- B. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks, and under temporary coverings.
 1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

- C. Protect sheet materials during handling to prevent breaking of corners and damage to surfaces.

1.06 Project Conditions

- A. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow attachment of other work.

Part 2 Products

2.01 Lumber - General

- A. Lumber Standards: Comply with PS 20-99, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review. Lumber design values are to comply with ASTM D245 and ASTM D2555.
- B. Inspection Agencies: Inspection agencies, and their grading rules include the following:
 - 1. Northeastern Lumber Manufactures Association (NELMA):
 - a. Standard Grading Rules
 - 2. Redwood Inspection Service (RIS):
 - a. Standard Specifications for Grades of California Redwood Lumber
 - 3. Southern Pine Inspection Bureau (SPIB):
 - a. Standard Grading Rules for Southern Pine Lumber
 - 4. West Coast Lumber Inspection Bureau (WCLIB):
 - a. No. 17 Standard Grading Rules for West Coast Lumber
 - 5. Western Wood Products Association (WWPA):
 - a. Western Lumber Grading Rules.
- C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
 - 1. For exposed lumber apply grade stamps to ends or back of each piece, or omit grade stamps entirely and issue certificate of grade compliance from inspection agency in lieu of grade stamp.
- D. Where nominal sizes are indicated, provide actual sizes required by PS 20-99 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 1. Provide dressed lumber, S4S, unless otherwise indicated.

2. Provide lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2" or less in nominal thickness, unless otherwise indicated.

2.02 Wood-Preservative-Treated Materials

- A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood).
 1. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- B. Pressure-treat aboveground items with waterborne preservatives to minimum retention of 0.25 lb/cu. ft. (4.0 kg/cu. m.). After treatment, kiln-dry lumber and plywood to maximum moisture content of 19 and 15%, respectively. Treat indicated items and the following:
 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 3. Wood framing members less than 18 inches (460 mm) above grade.
 4. Wood floor plates installed over concrete slabs directly in contact with earth.
- C. Pressure-treat wood members in contact with ground or freshwater with waterborne preservatives to minimum retention of 0.40 lb/cu. ft. (6.4 kg/cu. m.).
- D. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

2.03 Fire-Retardant-Treated Materials

- A. General: Where fire-retardant-treated wood is indicated, comply with applicable requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of Underwriter Laboratory (UL), U.S. Testing, or Timber Products Inspection, Inc.
- B. Interior Type A: For interior locations, use chemical formulation that produces treated lumber and plywood with the following properties under conditions present after installation:
 1. Bending strength, stiffness, and fastener-holding capacities are not reduced below values published by manufacturer of chemical formulation under elevated temperature and humidity conditions simulating installed conditions when tested.
 2. No form of degradation occurs due to acid hydrolysis or other causes related to treatment.

- 3. Contact with treated wood does not promote corrosion of metal fasteners.
- C. Exterior Type: Use for exterior locations, and where indicated.
- D. Inspect each piece of treated lumber or plywood after drying, and discard damaged or defective pieces.

2.04 Dimension Lumber

- A. General: If not indicated on Contract documents, provide dimension lumber of any species and grades indicated for applicable use category listed in table below. Lumber shall comply with ALSC National Grading Rule (NGR) provisions of inspection agency applicable to species.

Product (Nominal Dimension)	Grade	Use
Structural Light Framing 2 to 4 inches thick 2 to 4 inches wide	Select Structural No. 1 No. 2 No. 3	Structural applications where highest design values are needed in light framing sizes.
Light Framing 2 to 4 inches thick 2 to 4 inches wide	Construction Standard Utility	Where high-strength values are not required, such as wall framing, plates, sills, cripples, and blocking.
Stud 2 to 4 inches thick 2 inches and wider	Stud	Optional all-purpose grade designed primarily for stud uses, including bearing walls.
Structural Joists and Planks 2 to 4 inches thick 5 inches and wider	Select Structural No. 1 No. 2 No. 3	Intended to fit engineering applications for lumber nominal 5 inches and wider, such as joists, rafters, headers, beams, trusses, and general framing.

- B. Species and grades must meet or exceed the following values, unless indicated otherwise on Contract documents.
 - 1. Fb (extreme fiber stress in bending): Minimum 850 psi (5.9 MPa).
 - 2. E (modulus of elasticity): Minimum 1,300,000 psi (8950 MPa).
- C. Exposed Framing: Refers to dimension lumber which is not concealed by other work, and is indicated to receive stained, painted, or natural finish.
 - 1. Provide material hand-selected from lumber of species and grade indicated for type of use, for uniformity of appearance, and freedom from characteristics that would impair finish appearance.

2.05 Miscellaneous Lumber

- A. General: Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.

- B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated, and into shapes shown on Contract documents.
- C. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.
- D. Grade and Species: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common or Standard grade per WWPA of any species.

2.06 Fasteners

- A. General: Provide fasteners of size and type indicated, that comply with requirements specified.
 - 1. Where rough carpentry work is exposed to weather, in ground contact, or in areas of high relative humidity, provide fasteners with hot-dip, zinc-coating per ASTM A153
- B. Nails, Wire, Brads, and Staples: ASTM F1667FS FF-N-105B.
- C. Wood Screws: ASME B18.6.1.
- D. Lag Bolts: ASME B18.2.1.
- E. Bolts: Steel bolts complying with ASTM A307, Grade A with ASTM A563 hex nuts and, where indicated, flat washers.

2.07 Metal Framing Anchors

- A. General: Provide galvanized steel framing anchors of structural capacity, type, and size indicated, with allowable design loads as published by manufacturer, that meet or exceed those indicated.
- B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653, G60 coating designation; structural, commercial, or lock-forming quality, as standard with manufacturer for type of anchor indicated.

Part 3 Execution

3.01 Installation, General

- A. Discard units of material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.
- B. Set carpentry work to required levels and lines, with members plumb and true and cut and fitted.
- C. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards.
- D. Countersink nail heads on exposed carpentry work and fill holes.

- E. Use common wire nails, except as otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.

3.02 Wood Grounds, Nailers, Blocking and Sleepers

- A. Provide wherever shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.
- B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.
- C. Install permanent grounds of dressed, preservative treated, key-beveled lumber not less than 1-1/2" wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

3.03 Wood Furring

- A. Install plumb and level with closure strips at edges and openings. Shim with wood as required tolerance of finished work.

3.04 Wood Framing, General

- A. Provide framing members of sizes and on spacings shown, and frame openings as shown, or if not shown, comply with recommendations of "Manual for House Framing" of National Forest Products Association (N.F.P.A).
- B. Do not splice structural members between supports.
- C. Anchor and nail as shown, and to comply with "Recommended Nailing Schedule" of "Manual for House Framing" and "National Design Specifications for Wood Construction" published by N.F.P.A.
- D. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Set headers on edge and support on jamb studs.

3.05 Floor Joist Framing

- A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches (38.1 mm) of bearing on wood or metal, or 3 inches (76 mm) on masonry. Attach floor joists as follows:
 - 1. Where supported on wood members, by toe nailing or by using metal framing anchors.
 - 2. Where framed into wood supporting members, by using wood ledgers as shown or, if not shown, by using metal joist hangers.
- B. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches (1.2 m).

- C. Do not notch in middle third of joists; limit notches to 1/6 depth of joist, 1/3 at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 2 inches (51 mm) from top or bottom.
- D. Provide solid blocking of 2-inch nominal (38 mm actual) thickness by depth of joist at ends of joists unless nailed to header or band.
- E. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches (102 mm) or securely tie opposing members together. Provide solid blocking of 2-inch nominal (38 mm actual) thickness by depth of joist over supports.
- F. Under jamb studs at openings, provide solid blocking between joists.
- G. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.
 - 1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.
- H. Provide bridging of type indicated below, at intervals of 96 inches (2.4 m) o.c., between joists.
 - 1. Form diagonal wood bridging from bevel cut 1 by 3-inch nominal (19 by 64 mm actual) size lumber, double-crossed and nailed both ends to joists.
 - 2. Install steel bridging to comply with manufacturer's written instructions.

End of Section

Specifications

Division 31 Earthwork

Section 31 1100 Clearing and Grubbing

Part 1 General

1.01 Scope

This section includes all clearing and grubbing work indicated on the Plans and as required, complete with cutting and removal of trees, shrubs, vegetation, stumps, logs, brush, roots and undergrowth, and disposal of materials.

1.02 Related Work Specified Elsewhere

1. Unit Prices: Section 01 2200
2. Temporary Erosion and Sediment Control: Section 01 5713
3. Site Construction Performance Requirements: Section 01 8900
4. Grading: Section 31 2200
5. Subgrade Preparation: Section 31 2313

1.03 Soil Erosion and Sedimentation Control

The CONTRACTOR, at his expense, shall provide, maintain and remove such temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or as determined by the ENGINEER. The measures shall prevent surface runoff from carrying excavated materials into the waterways, to reduce erosion of the slopes, and to prevent silting in of waterways downstream of the Work. Also, the measures should include provisions to reduce erosions by the wind of all areas stripped of vegetation, including material stockpiles.

Comply with requirements of Section 01 5713, Temporary Erosion and Sediment Control.

Part 2 Products (Not Used)

Part 3 Execution

3.01 Clearing

All trees, stumps, brush, hedges, and other vegetation occurring within the contract limits as defined on the Plans or as directed by the ENGINEER shall be cut off flush with the ground and shall be completely removed.

3.02 Clearing and Grubbing

All trees, stumps, brush, shrubs, hedges, roots, corduroy, logs, matted roots, other vegetation and debris occurring within the contract limits as defined on the Plans or as directed by the ENGINEER, shall be completely removed. Depth of removal shall be in accordance with Article 3.04 or 3.05.

3.03 Selective Clearing

Selective clearing shall consist of removing and disposing of dead, diseased, poorly formed, or otherwise undesirable trees, undergrowth, stumps, uprooted trees and all debris. The trees to be removed will be marked and the area where the undergrowth is to be removed will be indicated on the Plans or designated by the ENGINEER.

A. Selective Clearing, Type I

All trees and stumps shall be cut off at an elevation not more than four (4) inches (100 mm) above the existing ground level.

B. Selective Clearing, Type II

All trees and stumps shall be chipped or ground down to an elevation approximately four (4) inches (100 mm) below proposed ground level.

3.04 Depth of Removal in Excavation Area

For excavation areas within roadways, parking lots, and other paved areas, the trees, stumps, and roots shall be removed to a depth of not less than 12 inches (300 mm) below the subgrade elevation. In all other excavation areas, the trees, stumps, and roots shall be removed to a depth of not less than 12 inches (300 mm) below

the finish surface elevation, or as indicated on the Plans or as designated by the ENGINEER.

3.05 Depth of Removal in Embankment Areas

Within embankment areas for roadways, parking lots, and other paved areas where the top of road material is five (5) feet (1.5 m) or less in height above the existing ground, the trees, stumps, and roots shall be removed to a depth of not less than 12 inches (300 mm) below the existing ground. Within embankment areas for roadways, parking lots, and other paved areas where the top of road material is more than five (5) feet (1.5 m) in height above existing ground, the trees and stumps shall be cut off flush with the existing ground surface. For embankment areas other than roadways, parking lots, and other paved areas, the trees and stumps shall be cut off flush with the existing ground surface, or as indicated on the Plans or as designated by the ENGINEER.

3.06 Removal of Trees, Stumps, and Other Vegetation

Where trees cannot be felled without danger to traffic or injury to other trees, structures or property, they shall be cut down in sections. The removal of stumps and roots may be accomplished by the use of a shredding machine meeting the approval of the ENGINEER.

3.07 Removing Corduroy

All logs, stumps, poles, brush, and other unsatisfactory material occurring in the contract limits at or below the surface of the ground and within the depth of four (4) feet (1.2 m) below the proposed plan grade shall be removed and shall be disposed of by the CONTRACTOR. When material is disposed of outside of the contract limits, disposal shall be as specified in Section 01 8900, Site Construction Performance Requirements.

The burial of trees, stumps and other vegetation, will not be permitted, except at disposal areas indicated on the Plans or as determined by the ENGINEER. Trees and stumps buried in these areas shall have a minimum cover of two (2) feet (0.6 m).

3.08 Holes and Trenches

All holes and trenches remaining after the clearing or grubbing operations in embankment areas, shall have the sides broken down or leveled, and shall be refilled with acceptable material. The material shall be moistened and properly compacted in layers by tampers or rollers to the density required under roadways, parking areas, and other special areas, as determined by the ENGINEER. The same construction procedure shall be applied to all holes and trenches remaining in excavation areas where the depth of holes exceeds the depth of proposed excavation.

3.09 Salvaging Timber

Trees required to be removed and having a diameter of four (4) inches (100 mm), or more, are classed as merchantable timber. On right-of-way, fee simple, merchantable timber shall become the property of the CONTRACTOR, unless otherwise specified in the Contract Documents. When such material is placed outside of the right-of-way, the CONTRACTOR shall obtain and provide the ENGINEER with written permission from the OWNER of the property on which the timber is to be placed.

Merchantable timber to be removed from areas outside of right-of-ways, fee simple, shall be cut and piled for the use of property owner, except where the CONTRACTOR provides the ENGINEER with a written agreement from the property owner that he does not desire the salvaged timber. Where the property owner has signed such an agreement, the salvaged timber will become the property of the CONTRACTOR.

When such material is placed outside the contract limits, the CONTRACTOR shall obtain and provide the ENGINEER with written permission from the owner of the property on which the timber is to be placed. Timber from 4 to 12 inches (100 to 300 mm) in diameter may be left in full tree lengths or cut to commercial lengths, at the option of the CONTRACTOR. Timber 12 inches (300 mm), or more, in diameter shall be cut into commercial lengths and piled separately from other timber.

End of Section

Section 31 2200 Grading

Part 1 General

1.01 Scope

This Section includes site grading as indicated on the Plans, complete with removing and salvaging topsoil, rough grading, finish grading, adjusting structures, and reconstructing structures.

1.02 Related Work Specified Elsewhere

1. Unit Prices: Section 01 2200
2. Temporary Erosion and Sediment Control: Section 01 5713
3. Site Construction Performance Requirements: Section 01 8900
4. Clearing and Grubbing: Section 31 1100
5. Subgrade Preparation: Section 31 2313
6. Structural Excavation and Backfill: Section 31 2316
7. Seeding: Section 32 9219
8. Sodding: Section 32 9223

1.03 Soil Erosion and Sedimentation Control

The CONTRACTOR, at his expense, shall provide, maintain and remove such temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or as determined by the ENGINEER. The measures shall prevent surface runoff from carrying excavated materials into the waterways, to reduce erosion of the slopes, and to prevent silting in of waterways downstream of the Work. Also, the measures should include provisions to reduce erosion by the wind of all areas stripped of vegetation, including material stockpiles.

Comply with requirements of Section 01 5713, Temporary Erosion and Sediment Control.

Part 2 Products (Not Used)

Part 3 Execution

3.01 Site Grading

Sites shall be graded as specified on the Plans or as determined by the ENGINEER. The CONTRACTOR shall carry out the grading operation to prevent standing water and soil saturation detrimental to structures and improvements. Provisions shall be made to preserve and protect trees and other vegetation specified on the Plans or determined by the ENGINEER as not to be removed.

3.02 Removing and Salvaging Topsoil

Topsoil encountered along the route of the construction shall be pushed back and preserved for use in restoration following completion of the construction. The topsoil must remain on each given parcel and lot throughout the Project including the existing road right-of-way adjoining the parcel or lot where it existed.

Removal of topsoil from the Project or movement of topsoil from one portion of the Project for use in another portion of the Project will not be allowed.

If there is insufficient working area, the topsoil may be removed, stockpiled and later replaced on the original lot or parcel. The CONTRACTOR shall furnish the ENGINEER with written permission obtained from the property owner of the property on which the topsoil is to be stockpiled, prior to commencing the stockpiling operation.

Topsoil shall be salvaged in an amount equivalent to the quantity required by the Plans. Topsoil salvaged in excess of that required by the Plans or as required by the ENGINEER will be disposed of by the CONTRACTOR at his expense.

Before removing topsoil, all vegetation shall be reduced to a height of approximately four inches (100 mm) and all such vegetation and all brush,

stones, rocks, and any other objectionable litter or foreign material shall be removed and disposed of before the ground is broken for topsoil removal.

Equipment and methods of operations shall be such as to avoid the lifting of the subsoil. If soil or weather conditions are unsuitable, the CONTRACTOR shall cease stripping until stripping can resumed in a suitable manner.

Topsoil shall be removed within the grading limits for cuts and shall be removed to a width and depth specified on the Plans or as determined by the ENGINEER.

The topsoil shall be stockpiled within the limits of construction in areas designated on the Plans, or in areas out of the way of construction as determined by the CONTRACTOR. Stockpiles shall be located and shaped so as to avoid diversion of storm water runoff, either in or out of the limits of construction, towards buildings, creation of standing water or interference of controlled irrigation. The CONTRACTOR shall not place topsoil around trunks and root areas of trees to be preserved.

Topsoil shall be kept separate from other excavated materials that are to be used for embankment and shall be completely removed from any designated area prior to the beginning of regular excavation or placing embankment in the area.

The topsoil stockpiles shall be located as near the original location as possible and no payment will be made for overhaul.

After the completion of construction, the topsoil shall be screened through a 5/8-inch maximum size mesh screen, spread, graded, raked and prepared for seeding or sodding.

3.03 Existing Sand On-Site

In those instances where the construction takes place within private easements, the sand shall not be removed from each parcel or lot. Sand encountered in existing road right-of-way may be used for construction purposes throughout the Project providing it meets the requirements for the material it is intended to be used for.

Removal of sand from the Project will not be allowed, except for the volume displaced by the new construction.

If there is insufficient working area, the sand may be removed, stockpiled and replaced on the original lot or parcel. The CONTRACTOR shall furnish the ENGINEER with written permission obtained from the property owner of the property on which the sand is to be stockpiled, prior to commencing the stockpiling operations.

3.04 Rough Grading

The site shall be graded as necessary to comply with the Plans or as determined by the ENGINEER. The subgrade shall be roughly established by cut or fill, approximately parallel to proposed finished grades and to elevations which allow for thickness of topsoil and installation of site or roadway improvements.

In fill areas all debris shall be removed from the area to be filled. All material detrimental to site improvement shall be removed from the site and acceptably disposed of as specified in Section 01 8900 Site Construction Performance Requirements.

Original ground shall be scarified and benched or otherwise treated to provide adequate bond and to prevent slippage of fill.

Fill material shall be free of debris or other detrimental material and shall have a moisture content within 2 percent of optimum moisture when placed. All fill shall be compacted to a density not less than 95% of the maximum unit weight and placed in layers no less than nine inches (230 mm) and no greater than 15 inches (380 mm). The maximum unit weight shall be determined by ASTM D698, Method B.

If possible fills or embankments shall be constructed when the ground is frost-free and there is favorable weather. However if winter grading is necessary, all ice and snow shall be removed from the surface of the ground before the fill or embankment is placed. No frozen material will be allowed in the fill area or in the embankment being constructed. Any frozen material on a partially completed fill shall be removed before placing any more fill. This frozen

material shall be stockpiled outside the grading limits until thawed. Thawed material from the stockpiled frozen material may be used in the fill and embankment areas.

3.05 Finish Grading

The subgrade shall be smoothed parallel to proposed finished grades and elevations specified on the Plans. The subgrade shall be scarified to assure bond with the topsoil prior to spreading of the topsoil.

The topsoil shall be spread uniformly to provide a smooth, even surface at a finish grade specified on the Plans or acceptable to the ENGINEER. After spreading, the topsoil shall be compacted lightly as necessary to minimize settlement. Final grades shall not vary more than one-tenth of a foot (30 mm) from the elevations indicated on the Plans.

Finished grading shall be done when the ground is frost-free and weather is favorable.

3.06 Adjust Structures

Structures to be adjusted shall be as called for on the Plans or as indicated by the ENGINEER. Adjustment of structures shall apply where the elevation of the casting is either raised 12 inches (300 mm) or less, or lowered six (6) inches (150 mm) or less.

A. For Rehabilitation/Resurfacing Projects

For structures in existing pavement, the pavement shall be sawcut a minimum of 5-foot by 5-foot unless otherwise shown on the plans.

1. For structures in concrete pavement, the structure shall be adjusted, backfilled and compacted as noted below. Six inches of aggregate base course, unless otherwise noted on the plans, shall be placed below the proposed concrete pavement.
 - a. In areas of new concrete pavement, the concrete pavement around the structure shall be poured integral with the rest of the pavement.
 - b. For resurfacing projects, expansion or epoxy anchored hook bolts shall be

placed 18-inches on center around the edges of the existing concrete pavement, unless otherwise shown on the plans. The concrete pavement, minimum 8-inches thick, shall be replaced around the structure to the grade of the adjoining concrete pavement.

2. For structures in bituminous pavement, the pavement shall not be sawcut until after the bituminous base or leveling courses have been completed. The structure shall be adjusted, backfilled and compacted as noted below. Six inches of aggregate base course, unless otherwise noted on the plans, shall be placed below the proposed pavement. A minimum of 8-inches of concrete pavement, unless otherwise noted on the plans, shall be placed to the elevation of the adjoining bituminous base or leveling courses. The bituminous wearing course around the structure shall be placed integral with the wearing course on the remainder of the project.

B. For Bituminous Reconstruction or New Construction Projects

The frame and cover on all new and existing structures shall be removed and the structure plated prior to placing the bituminous base or leveling courses. All bituminous base and leveling courses shall be placed over the plated structures. Prior to placing the bituminous wearing course, the bituminous base and leveling courses shall be sawcut a minimum of 5-foot by 5-foot unless otherwise shown on the plans. The structure shall be adjusted, backfilled and compacted as noted below. Six inches of aggregate base course, unless otherwise noted on the plans, shall be placed below the proposed pavement. A minimum of 8-inches of concrete pavement, unless otherwise noted on the plans, shall be placed to the elevation of the adjoining bituminous base course. The bituminous wearing course around the structure shall be placed integral with the wearing course on the remainder of the project.

Sawcutting, removal and replacement of concrete and bituminous pavement, and aggregate base course, shall be incidental to the adjusting the structure unless otherwise noted in the Contract Documents.

The existing frame and cover shall be carefully removed and stored, and shall be reinstalled on the same structure, unless a new frame and cover are called for on the Plans.

The brick courses or concrete adjustment rings shall be removed or installed as necessary to adjust the structure's frame and cover to the proper elevation.

The brick or concrete adjustment rings shall be set in mortar or installed as shown on the Plans and as determined by the ENGINEER.

The outside surface of the new brick or block structures shall receive a masonry plaster coat, a minimum of 1/2 inch (10 mm) thick.

The structure shall be properly backfilled with Class II granular material, compacted in place, and meeting the approval of the ENGINEER.

The flow in the entire system shall be maintained, at the CONTRACTOR's expense, while performing any part of the Work. Also, the structure shall be cleaned and all unsuitable material shall be disposed of at the CONTRACTOR's expense.

3.07 Reconstruct Structures

Structures to be reconstructed shall be as called for on the Plans or as determined by the ENGINEER. Reconstruction of structures shall apply where the elevation of the casting must be raised in excess of 12 inches (300 mm), lowered in excess of six (6) inches (150 mm), or to rebuild portions of the existing structure which are deteriorated.

A. For Rehabilitation/Resurfacing Projects

For structures in existing pavement, the pavement shall be sawcut a minimum of 5-foot by 5-foot unless otherwise shown on the plans.

1. For structures in concrete pavement, the structure shall be reconstructed,

backfilled and compacted as noted below. Six inches of aggregate base course, unless otherwise noted on the plans, shall be placed below the proposed concrete pavement.

- a. In areas of new concrete pavement, the concrete pavement around the structure shall be poured integral with the rest of the pavement.

- b. For resurfacing projects, expansion or epoxy anchored hook bolts shall be placed 18-inches on center around the edges of the existing concrete pavement, unless otherwise shown on the plans. The concrete pavement, minimum 8-inches thick, shall be replaced around the structure to the grade of the adjoining concrete pavement.

2. For structures in bituminous pavement, the pavement shall not be sawcut until after the bituminous base or leveling courses have been completed. The structure shall be reconstructed, backfilled and compacted as noted below. Six inches of aggregate base course, unless otherwise noted on the plans, shall be placed below the proposed pavement. A minimum of 8-inches of concrete pavement, unless otherwise noted on the plans, shall be placed to the elevation of the adjoining bituminous base or leveling courses. The bituminous wearing course around the structure shall be placed integral with the wearing course on the remainder of the project.

B. For Bituminous Reconstruction or New Construction Projects

The frame and cover on all new and existing structures shall be removed and the structure plated prior to placing the bituminous base or leveling courses. All bituminous base and leveling courses shall be placed over the plated structures. Prior to placing the bituminous wearing course, the bituminous base and leveling courses shall be sawcut a minimum of 5-foot by 5-foot unless otherwise shown on the plans. The structure shall be reconstructed, backfilled and compacted as noted below. Six inches of aggregate base

course, unless otherwise noted on the plans, shall be placed below the proposed pavement. A minimum of 8-inches of concrete pavement, unless otherwise noted on the plans, shall be placed to the elevation of the adjoining bituminous base course. The bituminous wearing course around the structure shall be placed integral with the wearing course on the remainder of the project.

Sawcutting, removal and replacement of concrete and bituminous pavement, and aggregate base course, shall be incidental to the reconstructing the structure unless otherwise noted in the Contract Documents.

The existing frame and cover shall be carefully removed and stored, and shall be reinstalled on the same structure unless a new frame and cover are called for on the Plans.

The existing corbel entrance sections or precast concrete chimney type entrance shall be removed along with any additional brick courses or precast concrete sections necessary to achieve the amount of reconstruction called for on the Plans or as determined by the ENGINEER.

The necessary brick work and precast concrete sections shall be installed to meet the design grade.

Manhole steps shall be furnished and shall be installed, as necessary, so that maximum spacing is 24-inches (600 mm). The brick or concrete adjustment rings shall be set in mortar or installed as shown on the Plans and as determined by the ENGINEER.

The outside surface of the new brick or block structures shall receive a masonry plaster coat, a minimum of 1/2 (10 mm) inch thick. The structure shall be properly backfilled with Class II granular material, compacted in place, and meeting the approval of the ENGINEER.

The flow in the entire system shall be maintained, at the CONTRACTOR's expense, while performing any part of the Work. Also, the structure shall be cleaned and all unsuitable material shall be disposed of at the CONTRACTOR's expense.

End of Section

Section 31 2313

Subgrade Preparation

Part 1 General

1.01 Scope

This Section includes preparing subgrade for pavement construction complete with excavation, embankments, proof rolling, subgrade undercut and backfill, subgrade stabilization fabric, subbase, right-of-way ditching, right-of-way restoration, field quality control, and appurtenances.

1.02 Related Work Specified Elsewhere

1. Unit Prices: Section 01 2200
2. Temporary Erosion and Sediment Control: Section 01 5713
3. Site Construction Performance Requirements: Section 01 8900
4. Clearing and Grubbing: Section 31 1100
5. Slope Protection: Section 31 3500
6. Dewatering: Section 31 2319
7. Fences and Gates: Section 32 3100
8. Plants: Section 32 9000
9. Seeding: Section 32 9219
10. Sodding: Section 32 9223
11. Guardrails: Section 34 7113

1.03 Reference Standards

Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications:

ASTM- ASTM International

AASHTO- American Association of State
Highways and Transportation
Officials

MDOT- Michigan Department of
Transportation, Standard Specifications for
Construction, latest edition.

1.04 Allowable Tolerances

The finish subgrade surface shall be shaped to conform to plan grade and cross section within a tolerance of one-inch (25 mm) in ten (10) feet (3.0 m).

1.05 Submittals

A. Test Reports

The testing lab shall provide the ENGINEER with two (2) certified copies of the sieve analysis of the backfill material. The testing of the material and the certification of the test results shall be performed by a testing laboratory approved by the ENGINEER.

The testing lab shall provide the ENGINEER with two (2) certified copies of the compaction and moisture tests of the backfill and subgrade materials. The testing of the materials and the certification of the test results shall be performed by a testing laboratory approved by the ENGINEER.

B. Samples

Submit sample of the proposed subgrade stabilization fabric measuring not less than 1 yd² (1 m²) in area, and the manufacturer's certification that the proposed fabric meets or exceeds all requirements listed in Article 2.03 of this Section. All submissions shall be made not later than 10 working days prior to any installation.

1.06 Product Delivery Storage and Handling

Geotextile fabric shall be furnished and stored in a wrap that will protect the geotextile from ultraviolet radiation and abrasion. The geotextile shall be covered with the aggregate base as per plan within two (2) weeks of its placement.

1.07 Soil Erosion and Sedimentation Control

The CONTRACTOR shall provide, maintain and remove such temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or as determined by the ENGINEER. The measures shall prevent surface runoff from carrying excavated materials into the drain, to reduce erosion of the slopes, and to prevent silting in of drain downstream of the Work. Also, the measures should include provisions to reduce erosions by the wind of all areas stripped of vegetation, including material stockpiles.

Comply with requirements of Section 01 5713, Temporary Erosion and Sediment Control.

CBR Puncture Strength	ASTM D6241	900 lbs. (min)
Apparent Opening Size	ASTM D4751	40 – 70 U.S. Sieve
Permittivity	ASTM D4491	0.05 per sec ⁻¹ (min)

Part 2 Products

2.01 Granular Materials

The granular material gradation shall conform to the grading requirements for granular material Class II as specified in MDOT, Section 902.07.

2.02 Aggregate Materials

Aggregate materials, used for undercut backfill shall be crushed limestone, natural aggregate, blast furnace slag, or crushed concrete, meeting the requirements of 21AA, 21A or 22A as specified in MDOT Section 902.05.

Crushed concrete shall be free of all steel and other deleterious materials.

2.03 Subgrade Stabilization Fabric

Subgrade stabilization fabric shall be composed of synthetic fibers formed into a woven fabric. The fibers shall be composed of 85% propylene or ester polymers. The geotextile shall conform to the following requirements listed below:

Property	Test Procedure	Test Result
Grab Tensile	ASTM D4632	270 lbs. (min)
Elongation	ASTM D4632	15% (min)
Trapezoidal Tear	ASTM D4533	100 lbs. (min)

Part 3 Execution

3.01 Removing Structures

Structures and sewers to be removed shall be called for on the Plans or as determined by the ENGINEER. Removal or abandonment of structures shall be in accordance with Section 01 8900, Site Construction Performance Requirements.

3.02 Holes

Earth removed during any phase of the excavation or removal operations, resulting in a hole or void, shall be replaced by backfilling to the proposed subgrade with a suitable granular material approved by the ENGINEER. The material shall be compacted to 95% of its maximum unit weight.

The furnishing, placing and compacting of the backfill material shall be at the CONTRACTOR's expense.

3.03 Salvaging and Stockpiling Topsoil

Topsoil, within the grading limits for cuts, and where the fill is less than five (5) feet (1.5 m) in height to the top of proposed road, shall be removed to a depth and width specified on the Plans. Topsoil from peat and muck areas shall not be removed. Topsoil salvaged in excess of that required by the Plans will be disposed of by the CONTRACTOR at his expense.

Removing and salvaging topsoil shall be in accordance with Section 31 2200, Grading.

3.04 Preparing Roadway Subgrade

All muck, peat and other unsuitable material within the roadway shall be removed, displaced or otherwise treated, as shown on the Plans or as directed by the ENGINEER. All deposits of frost heave material within lines two (2) feet (0.6 m)

outside the proposed roadbed shall be removed to a depth of three (3) feet (0.9 m) below the surface of the earth grade, unless otherwise shown on the Plans or as determined by the ENGINEER. All ice and snow shall be removed from the surface of the ground before the embankment is placed.

All muck, peat, frost heave material and other unsuitable material shall be disposed of outside the highway limits or shall be spread uniformly in low places beyond the roadway limits when so approved by the ENGINEER.

Old road surfacing or gravel, crushed stone, or other nonrigid type surfacing, occurring within the area of the roadbed and underlying proposed embankment less than 1-foot in depth, and which is not to be salvaged and incorporated in the new Work, shall be plowed or scarified full depth, spread and compacted to form a uniform foundation, before any new embankment is placed.

Old pavement and other rigid structures, occurring within the area of the roadbed and underlying the proposed embankment less than 1-foot in depth and which are not to be incorporated into the new Work, shall be broken up and removed.

3.05 Subgrade

The area to be paved shall be excavated and smoothed to the line, grade and cross section as indicated on the Plans.

The subgrade between the lines two (2) feet (0.6 m) on either side of the proposed edge of pavement or curb shall be compacted to 95% of the maximum unit weight for a depth of seven (7) inches (175 mm), by rolling with a roller weighing not less than ten (10) tons (9000 kg).

The subgrade shall be completed ahead of placing forms or paving a distance equal to the distance of one day's average paving operation. Prior to the paving operation, the subgrade shall be shaped and compacted to the Plan cross section by approved mechanical means.

3.06 Pavement Excavation

Pavement excavation shall consist of all Work required to construct the earth grade and its appurtenances true to the lines, grades, and cross sections called for on the Plans and in accordance

with these Specifications. Excavation shall consist of the following items, any of which or all of which may be included or incidental to it; removing trees, stumps, hedges, roots, culverts, sewers, miscellaneous structures, roadway excavation, removing of all asphalt or concrete pavements, curbs, curb and gutters, sidewalks, end headers, removing aggregate surfaces, salvaging and stockpiling topsoil, subgrade undercut, excavation for structures, trimming and finishing earth grade, fine grading, right-of-way ditching and restoration, and the disposal of all unsuitable material.

All large stones, trees, stumps, brush, shrubs, logs, matted roots, other vegetation and debris occurring between lines three (3) feet (0.9 m) outside the grading limits or as otherwise shown on the Plans shall be completely removed and properly disposed of as specified in Section 31 1100, Clearing and Grubbing.

All earth and other existing materials shall be excavated for the full depth and width of the cross section as shown on the Plans. Material shall be excavated sufficiently for setting of forms or slip-form equipment. Excavation shall be limited to 3,000 linear feet (900 m) of right-of-way unless additional lengths are requested in writing and approved by the ENGINEER.

Excess excavated material shall be removed from the project by the CONTRACTOR along approved routes to disposal sites approved by the OWNER. Disposal of excess excavation and maintenance of the dump sites shall be considered incidental to the price paid for excavation and shall be as specified in Section 01 8900, Site Construction Performance Requirements.

3.07 Borrow Excavation

Materials which are secured from locations outside of the project limits for the purpose of completing embankments and other items, will be considered as borrow excavation. All borrow pits and the materials to be removed therefrom shall be subject to the inspection of the ENGINEER and shall be secured by the CONTRACTOR, unless otherwise provided.

Borrow excavation will be measured by volume in cubic yards compacted in place, based on the neat lines called for on the Plans or as authorized by the ENGINEER. To facilitate the accurate

measurement of borrow quantities, unless otherwise specified in the Contract Documents, the CONTRACTOR shall perform all the regular excavation and grading with existing materials for any designated area and the ENGINEER will cross section these areas prior to the CONTRACTOR furnishing and placing the required borrow material. The ENGINEER will then resection the completed area and compute the volume of borrow material in its compacted-in-place state. Any borrow material placed beyond the neat lines called for on the Plans or which is not authorized by the ENGINEER in writing will not be measured and computed as borrow excavations. Measurement of borrow material by truck count will not be acceptable.

Public and private roads used by the CONTRACTOR between the source of borrow and the Project shall be maintained by the CONTRACTOR, at his expense, including repairs of any damage caused by his operations. Also included is the application of a dust palliative when necessary, as determined by the ENGINEER.

3.08 Embankments

Embankments shall be constructed with sound earth. The materials shall be deposited and compacted by either the Twelve Inch Layer Method, or the Controlled Density Method. The Controlled Density Method will be required unless the twelve inch layer method or some other method is specifically called for on the Plans.

The topsoil shall be stripped from the entire fill area. The depth of the topsoil to be removed shall be as shown on the Plans or as determined by the ENGINEER. After the topsoil is removed, the entire area upon which the embankment is to be constructed shall be compacted to not less than 90% of the maximum unit weight, to a depth of nine (9) inches (225 mm).

Where stones are prevalent, the material shall be carefully placed so that all large stones will be well distributed and the crevices completely filled with smaller stones, earth, sand or gravel so as to form a solid embankment. Any rock or fragmental material of such size as would prohibit it from being placed in layers of the specified depth shall not be placed in the embankment. In no case shall stones over three (3) inches (75 mm) in diameter be

placed within 12 inches (300 mm) of the surface of the earth grade within the areas between lines two (2) feet (0.6 m) outside of the edges of proposed roadbed.

Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material.

The construction requirements for the two (2) methods of placing and compacting embankments are as follows:

A. Twelve-Inch Layer Method

The material shall be deposited and spread in layers not more than 12 inches (300 mm) in depth, loose measure, parallel to the finished grade and extending to the full width of the embankment. The material shall be deposited by operating the conveying equipment over the layer being placed, insofar as feasible.

Each layer shall be compacted to not less than 95% of the maximum unit weight as determined at the existing moisture content. The operation of compacting shall be continued until each layer is compacted to the required density for its full width.

B. Controlled Density Method

The material for the embankment shall be deposited and spread in layers not more than nine (9) inches (225 mm) in depth, loose measure, and extending to the full width of the embankment, except that granular material may be spread and compacted in layers not more than 15 inches (375 mm) in thickness if the specified density is obtained.

The material for embankments of five (5) feet (1.5 m) or less and the bottom four (4) feet (1.2 m) of embankments of more than four (4) feet (1.2 m) above the surface of the ground upon which the embankment is to be constructed shall have not more than the optimum moisture content at the time of compaction. The material for that part of the embankment more than five (5) feet (1.5 m) above the surface of the ground upon which the embankment is to be constructed shall have a moisture content of not greater than three (3)

percent above optimum at the time of compaction, except that the moisture content of the top three feet (0.9 m) of the embankment shall not exceed optimum. If granular material is used to construct the embankment, it shall be at a moisture content below saturation.

If the material contains an excess of moisture, it shall be dried to the required moisture content before being compacted.

Each layer of material containing the required amount of moisture shall be compacted to not less than 95% of its maximum unit weight, unless otherwise specified, before the succeeding layer is started.

When the original ground upon which the embankment is being placed, or any section of compacted embankment, or the soil in cut sections becomes rutted or distorted by the CONTRACTOR's equipment, the method of operation shall be changed to eliminate this condition. The CONTRACTOR shall reshape and recompact any areas so rutted or distorted at his own expense. This shall be done before any succeeding layers are placed.

3.09 Rough Grading

CONTRACTOR shall rough grade as close as possible to finished subgrade leaving a minimum to be removed in fine grading.

Any excavated material removed during grading and stored along the line of Work between curb and sidewalk on improved lawns shall not be left longer than 48 hours. Lawns or otherwise improved areas shall be left in a neat and clean state within the specified 48 hours.

During the excavation operation, including the placing of the subbase, the Work area shall be kept free of water. A dewatering system shall be provided and maintained by the CONTRACTOR at his expense. The dewatering system shall remain in operation until the paving is completed.

3.10 Proof Rolling

After removal of topsoil or other overburden and after construction of embankments, proof roll the existing subgrade with six passes of a minimum 15

ton pneumatic-tired roller. Operate the roller in a systematic manner to assure the number of passes over all areas, and at speeds between 2.5 and 3.5 miles per hour. When proof rolling under structures, one-half of the passes made with the roller shall be in a direction perpendicular to the other passes.

Proof rolling shall be done in the presence of the ENGINEER. Rutting or pumping shall indicate unsatisfactory material and that material shall be undercut as determined by the ENGINEER, and replaced with the appropriate fill material.

Perform proof rolling only when weather conditions permit. Do not proof roll wet or saturated subgrades. Materials degraded by proof rolling a wet or saturated subgrade shall be replaced by the CONTRACTOR as determined by the ENGINEER at no cost to the OWNER. Notify the ENGINEER 3 days prior to proof rolling.

3.11 Subgrade Undercut Excavation

Unsuitable subgrade excavation shall be the operation of:

- (1) removing unsuitable soils as determined by the ENGINEER, below the level of the ground after topsoil has been stripped in fill areas where the embankment is to be five (5) feet (1.5 m) or less in height to plan grade, or
- (2) the removal of unsuitable soils below the subgrade elevation, as determined by the ENGINEER in cut areas after the subgrade has been established.

In fill areas, after topsoil has been stripped in accordance with Article 3.03 of this Section, the ENGINEER will inspect the embankment area to certify the adequacy of the native soils and to determine the extent of any additional excavation of unsuitable soils prior to placing the first lift of the embankment.

In cut areas after the subgrade elevation has been established by the mass grading operation, the ENGINEER will inspect the subgrade to determine the extent of any additional excavation of unsuitable soils.

The areas excavated of unsuitable material, unless otherwise specified in the Contract Documents,

shall be backfilled with nonfrost heaving material similar to the adjacent soil. However, in areas as determined by the ENGINEER where free water due to seepage is present, the excavation shall be backfilled with Granular Material, Class II, and drainage shall be provided. The backfill shall be compacted to not less than 95% of the maximum unit weight, unless otherwise specified.

3.12 Subgrade Stabilization Fabric

Place Subgrade Stabilization Fabric on prepared subgrade or subbase in the manner and at the location as called for on the plans. The fabric shall be laid smooth and free of tension stress, wrinkles or creases. Fabric strips shall be placed to provide a minimum overlap of 24 inches (600 mm) for each joint. Fabric shall be placed so that the upper strip will overlap the next lower strip. Should the geotextile be damaged during construction, the torn or punctured section shall be repaired by placing a piece of fabric that is sufficiently large to cover the damaged area plus two feet (0.6 m) to adjacent undamaged geotextile in all directions.

3.13 Trimming and Finishing Earth Grade

After the earth grade has been constructed to the required grade, all stones and rocks more than three (3) inches (75 mm) in diameter, appearing on the surface of the subgrade shall be removed.

The earth grade and the subgrade shall be trimmed to the grade called for on the Plans. The subgrade, where a subbase or base course is required, shall be trimmed to the established grade within ± 0.1 foot (30 mm). Where a subbase or base course is not required, the subgrade shall be trimmed to the established grade within $\pm 3/4$ inch (20 mm).

The earth grade outside the subgrade shall be trimmed, all irregularities made smooth and the entire site or roadway completed to the required lines, grades, and cross sections. Backslopes and fill slopes shall be finished as either Class A or Class B slopes. Class A slopes shall be required unless otherwise specified in the Contract Documents.

A. Class A Slopes

Class A slopes shall be finished to the average slopes shown on the Plans with no variations at any point more than 0.1 foot (30 mm) above

or below the established grade measured at right angles to the slopes.

B. Class B Slopes

Class B backslopes shall be finished to the average slopes shown on the Plans with no variations at any point more than 0.5 foot (150 mm) above or below the established grade measured at right angles to the slope. The degree of finish of the slopes shall be that obtainable from machine operations. The smoothness of surface finish ordinarily associated with template or string line and hand operations will not be required, but abrupt variations will not be permitted. All debris except sod, leaf mold and rotted forest litter shall be removed and loose clods of earth extending beyond the 0.5 foot (150 mm) tolerance shall be broken or removed.

Class B fill slopes shall be finished to within 0.2 foot (60 mm) of the established grade and cross section from the outside shoulder line for a distance of three (3) linear feet (0.9 m) down the slope. The remainder of the completed fill slope shall conform to the requirements for Class B backslopes. Where waste earth or other surplus material is deposited on fill slopes, the slopes may be flattened or otherwise altered as directed by the ENGINEER, to produce a uniform cross section which blends with the topography and presents a pleasing appearance.

Where trees or other restrictions do not interfere, the tops of backslopes, bottoms of fill slopes and all other angles in the lines of the cross section shall be rounded to form vertical curves as shown on the Plans or as determined by the ENGINEER. All transitions in length of vertical curves shall be gradual and shall present a uniform and attractive appearance. When ditches are constructed in peat, vertical curves may be omitted.

3.14 Subbase

Granular material for subbase shall be evenly spread and compacted as specified in MDOT Section 301.

The thickness of each layer placed shall be determined by the required density obtained but

shall not exceed 15 inches (375 mm) in depth, loose measure.

The subbase shall be constructed to the alignment, grade and cross section shown on the Plans. Should the subgrade at any time prior to or during the placing of the subbase become soft or unstable so that rutting occurs in the subgrade, or if the subgrade material is forced up into the subbase material, the operation shall immediately cease and the mixed material shall be removed and disposed of. The subgrade shall be corrected and new subbase material placed and compacted. This Work shall be considered incidental to the construction of the Project.

3.15 Scarify, Re-Grade and Compact Existing Subgrade

The existing subgrade (base) shall be scarified to a depth of 9-inches to the limits as shown on the plans. The subgrade shall then be re-shaped to the cross section as shown on the plans and compacted. The subgrade shall then be compacted to 95% of the maximum unit weight by rolling with a roller weighing not less than ten (10) tons (9000 kg).

3.16 Roadway Ditching

Ditching shall be constructed at the locations called for on the Plans or as determined by the ENGINEER. The ditch may be shaped by "Machine Grading" or another method approved by the ENGINEER to achieve the cross section, line and grade shown on the Plans.

The excess material from the ditch construction shall be disposed of by the CONTRACTOR at his expense.

The ditch section shall be graded to receive either topsoil and seed or topsoil and sod. The topsoil, seed, sod, fertilizer and mulch shall conform to the requirements specified on the Plans and in Section 32 9219, Seeding or Section 32 9223, Sodding.

The CONTRACTOR, at his expense, shall furnish, place and compact any additional material needed to construct the ditch at the location and cross sections called for on the Plans.

3.17 Right-of-Way Restoration

The right-of-way shall be restored in accordance with the type and location specified on the Plans. The right-of-way may be shaped by "Machine Grading" or another method approved by the ENGINEER to achieve the cross section, line and grade shown on the Plans.

The excess material from the right-of-way restoration operation shall be disposed of by the CONTRACTOR at his expense, as specified in Section 01 8900, Site Construction Performance Requirements.

The right-of-way shall be graded to receive either topsoil and seed or topsoil and sod. The topsoil, seed, sod, fertilizer and mulch shall conform to the requirements specified on the Plans and in Section 32 9219, Seeding or Section 32 9223, Sodding.

The CONTRACTOR, at his expense, shall furnish, place, and compact any additional fill, meeting the approval of the ENGINEER, needed to construct the right-of-way to the cross sections called for on the Plans.

3.18 Machine Grading

The Work of machine grading shall consist of light grading of such character that, in general, the excavation from ditches and roadbed will be utilized in shaping shoulders and adjacent shallow fills and the work can be performed by a blade grader or similar equipment. Machine grading shall apply on the sections shown on Plans or specified in the Proposal.

The Work shall include all necessary scarifying, plowing, discing, moving and shaping the earth to develop the cross section shown on Plans. Ditches shall be in reasonably close conformity with the line and grade as shown on the Plans or as directed and must drain runoff waters to outlets shown on the Plans or designated by the ENGINEER. The roadbed shall be finished to grade with a blade grader or equivalent equipment. All intersections, approaches, entrances, and driveways shall be graded as shown or as directed, except that loading and hauling of earth will not be required as part of this Work.

3.19 Maintenance Aggregate

The CONTRACTOR shall furnish and install 21A, 21AA or 22A maintenance aggregate to maintain

pedestrian and traffic access. Aggregate shall be placed and compacted to maintain access in areas as determined by the ENGINEER. Maintenance aggregate will be incidental to the Project unless otherwise specified in the Contract Documents.

3.20 Testing

During the course of the Work, the ENGINEER may require testing for compaction, sieve analysis and moisture content of the backfill and subgrade materials. The taking of samples and the testing required shall be performed by a testing laboratory suitable to the OWNER and approved by the ENGINEER. The ENGINEER shall determine the location and number of samples to be made. The testing laboratory shall furnish the ENGINEER with two (2) certified copies of the results of all tests. Testing procedures shall conform to current MDOT Standards for Construction. The cost for testing and sampling shall be at the expense of the OWNER.

The maximum unit weight when used as a measure of compaction or density of soils shall be understood to mean the maximum unit weight per cubic foot (or cubic meter) as determined by ASTM D1557, Method D, modified to include all the material passing the 1-inch (25 mm) sieve.

3.21 Defective Work

Any portion of the backfill, subbase or subgrade which is deficient in the specified density shall be corrected by methods meeting the approval of the ENGINEER.

Any extra testing or sampling required by the ENGINEER, because of deficiencies, shall be at the CONTRACTOR's expense.

End of Section

Section 31 2316

Structural Excavation and Backfill

Part 1 General

1.01 Scope

This Section includes excavation for structures, removal and disposal of excavated materials, backfilling, backfill materials and compaction.

1.02 Related Work Specified Elsewhere

1. Temporary Erosion and Sediment Control: Section 01 5713
2. Site Construction Performance Requirements: Section 01 8900
3. Clearing and Grubbing: Section 31 1100
4. Grading: Section 31 2200
5. Dewatering: Section 31 2319
6. Seeding: Section 32 9219
7. Sodding: Section 32 9223
8. Water Utility Distribution Piping Section 33 1100
9. Sanitary Utility Sewerage Piping: Section 33 3000
10. Sanitary Utility Force Mains: Section 33 3400
11. Storm Utility Drainage Piping: Section 33 4100

1.03 Reference Standards

Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications:

ASTM - ASTM International

AASHTO - American Association of State Highway Transportation Officials

MDOT - Michigan Department of Transportation Standard Specifications for Construction, latest edition

1.04 Submittals

The testing laboratory shall provide the ENGINEER with two (2) certified copies of the test results of the compaction of the backfill. The testing for compaction and the certification of the test results shall be performed by a testing laboratory approved by the ENGINEER.

1.05 Soil Erosion and Sedimentation Control

The CONTRACTOR shall provide, maintain and remove such temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or as determined by the ENGINEER. The measures shall prevent surface runoff from carrying excavated materials into the waterways, to reduce erosion of the slopes, and to prevent silting in of waterways downstream of the Work. Also, the measures should include provisions to reduce erosion by the wind of all areas stripped of vegetation, including material stockpiles.

Comply with requirements of Section 01 5713, Temporary Erosion and Sediment Control.

Part 2 Products

2.01 Granular Materials

The granular material gradation shall conform to the grading requirements for granular material, Classes I and II, as specified in MDOT, Section 902.07. The granular material shall be natural bank run sand.

2.02 Coarse Aggregate

The coarse aggregate gradation shall conform to coarse aggregate, 6A, as specified in MDOT, Section 902.03.

Part 3 Execution

3.01 Dewatering

The area within the vicinity of the new Work shall be dewatered in accordance with Section 31 2319, Dewatering prior to the excavation operation. The depth of the dewatering shall be sufficient to allow the excavation to remain in a dry condition during the construction of the structure, including the excavating, backfilling and compacting operations.

3.02 Sheeting, Shoring, and Bracing

The CONTRACTOR shall furnish, place and maintain at all times such sheeting, shoring, and bracing of the excavated area as may be required for safety of the workmen and for protection of the new Work or adjacent structures, including pavement, curbs, sidewalks, pipelines and conduits next to, or crossing the excavated area, and for the protection and safety of pedestrian and vehicular traffic.

The CONTRACTOR shall be responsible for the complete design of all sheeting, shoring and bracing Work. The design shall be appropriate for the soil conditions, shall be of such strength, quality, dimension and spacing as to prevent caving or loss of ground or squeezing within the neat lines of the excavation, and shall effectively restrain movement of the adjacent soil. Prior to installing the sheeting, shoring or bracing, the CONTRACTOR shall submit Plans for this Work to the ENGINEER for informational purposes only.

Sheeting, shoring, and bracing, and excavation shall conform to current federal or state regulations for safety.

Where indicated on the Plans and where necessary in the Work, install and leave sheeting, shoring, and bracing in place. No extra compensation shall be paid to the CONTRACTOR for sheeting, shoring or bracing left in place unless otherwise indicated in the Proposal.

Supports for pipes, conduits, etc., crossing the excavated area shall conform to the requirements of the owners of such facilities and if necessary, shall be left in place.

The furnishing, placing, maintaining and removing of sheeting, shoring, and bracing materials shall be

at the CONTRACTOR's expense unless otherwise indicated in the Proposal.

The CONTRACTOR shall not remove the sheeting, shoring or bracing until the structure has obtained sufficient strength to support the external loads. The sheeting, shoring and bracing material shall not come in contact with the structure, but shall be installed so that no concentrated loads or horizontal thrusts are transmitted to the structure.

3.03 Cofferdams

A cofferdam shall consist of the maintenance, installation and removal of a substantially watertight enclosure or a well-point system or similar system, which will permit construction of the substructure, above seal or subfooting, in the dry and without damage to the Work. Alternate methods, where used in lieu of cofferdams, will be permitted by authorization only. Such authorization will be considered only after receipt of a permit from all federal, local or State agencies with jurisdiction for the alternate method.

Stream diversion and earth dikes, where used in lieu of cofferdams or a well-point system will be permitted by authorization only. Such authorization will be considered only after receipt of a permit from all federal, local or State agencies with jurisdiction for such construction.

The interior dimensions of cofferdams shall be such as to give sufficient clearance for the construction of forms and the inspection of their exteriors, and to permit dewatering outside of the forms.

Cofferdams, caissons or cribs which are tilted or moved laterally during the process of sinking shall be righted or enlarged so as to provide the necessary clearance.

Cofferdams shall not be braced to substructure forms. They shall be constructed so as to protect the Work in place against damage from high water and to prevent injury to the foundation by erosion. No timber bracing shall extend into or remain in the finished concrete.

Cofferdams shall be removed in such a manner as not to disturb or mar the finished concrete. When called for on the Plans or where necessary in the Work, cofferdam sheeting shall be left in place.

The furnishing, construction, maintenance and removal of the cofferdams including pumping shall be at the CONTRACTOR's expense. If the CONTRACTOR elects to use a well-point system or similar system, he shall be responsible for any claims for damages resulting therefrom.

3.04 Excavation

Excavation shall include the site clearing and grubbing, the excavating and disposing of all materials encountered, the supporting and protecting of all structures and/or utilities encountered above and below the ground surface, and the removal of water from the construction site. Excavation shall also include the removal of existing structures, as shown on the Plans or as determined by the ENGINEER. Rock excavation, if applicable, shall be performed as a part of the excavation in accordance with specifications contained elsewhere.

The CONTRACTOR shall keep the limits of his excavation operations within a reasonable close conformity with the location and grade, of each structure.

The excavated materials shall be temporarily stored in a manner that will not cause damage to trees, shrubs, fences, improvements, utilities, private property or traffic. The excavated materials shall not be placed at such locations that will endanger the banks of the excavation by imposing loads thereon.

The excavation shall be of sufficient size to allow for the construction of the new Work, the placing and compacting of the backfill and for the dewatering operation.

When concrete is to bear on or against an excavated surface other than rock, special care shall be taken not to disturb the surface. The final removal of the foundation material to grade shall not be made until just prior to the placing of the concrete.

Concrete shall not be placed until the depth of the excavation has been checked and the suitability of foundation material has been reviewed by the ENGINEER.

Excavated material, determined by the ENGINEER as suitable for backfill may be used. All excess materials shall be disposed by the

CONTRACTOR, at his expense, as specified in Section 01 8900, Site Construction Performance Requirements.

The elevations for the bottom of footings shall be subject to such changes as are necessary to insure a satisfactory foundation. Any changes required shall be reviewed by the ENGINEER prior to making the change.

The surface of all rock or other hard material upon which concrete is to be placed shall be free of all loose fragments, cleaned and cut to a firm surface.

The surface shall be level, stepped or serrated, as shown on the Plans.

All unsound material underlying proposed structures shall be removed and replaced with granular material approved by the ENGINEER, in layers not exceeding six (6) inches (150 mm) in depth. Each layer shall be compacted to 95% of maximum unit weight unless indicated otherwise on the Plans, or within these specifications.

3.05 Backfill

Backfill material shall be placed only after the new Work and backfill material have been inspected by the ENGINEER.

Backfill shall not be placed against any portion of the new Work until the required curing, surface finishing and waterproofing of such portions have been completed. Backfill which will place an unequalized horizontal loading on the new Work shall not be placed until the concrete has attained at least 70% of its design strength. To equalize horizontal loadings, the required backfill around the new Work shall be placed on opposite sides at the same time.

Granular material shall be used for backfilling within three (3) feet (1 m) of all manholes, chambers, valve wells, valve boxes, other pipeline structures, footings, piers, abutments, columns, walls, foundations, etc., unless otherwise indicated in the Contract Documents.

All spaces excavated and not occupied by the new Work or by the specified backfill material, shall be backfilled with suitable material from the excavation.

After the backfill has been placed and compacted to the flow line elevation of any weep holes

indicated on the Plans, the back end of each weep hole shall be covered with not less than two (2) cubic feet (0.5 m³) of coarse aggregate.

Large stones, boulders, broken rocks, concrete, and masonry shall not be used in the backfill.

The backfill shall be carried up to the surface of the adjacent ground or to the elevation of the proposed earth grade, and its top surface shall be neatly graded. Fills around all new Work shall be trimmed to the lines shown on the Plans or as directed by the ENGINEER.

3.06 Compacting Backfill

All backfill behind and around the new Work shall be placed in layers, not more than nine (9) inches in depth, and shall be compacted to not less than 95% of the maximum unit weight.

Areas where the density does not affect the construction, as determined by the ENGINEER, shall be compacted to not less than 90% of maximum unit weight.

Backfill material shall be placed as specified in MDOT, Section 206.03.B, except for the following modifications. The backfill material shall have a moisture content not greater than three (3) percent above optimum, at the time of compaction. If the material contains an excess of moisture, it shall be dried to the required moisture content before being installed.

Each layer of material containing the required amount of moisture shall be compacted to not less than 95% of the maximum unit weight, unless otherwise specified on the Plans or authorized by the ENGINEER, before the succeeding layer is started.

Compaction of the backfill will not be paid for separately, but shall be considered incidental to the Work of backfilling and shall include all the Work of manipulating the soil to obtain the specified densities. No additional compensation will be allowed for any delay required to obtain the specified moisture content or the specified density.

3.07 Cleanup

Immediately following the placing and compacting of the backfill, the excess material shall be removed and disposed of by the CONTRACTOR, at

his expense, as specified in Section 01 8900, Site Construction Performance Requirements.

The construction area shall be graded and left in a neat, workmanlike condition.

At a seasonally correct time, the disturbed area shall be raked, having topsoil placed thereon, fertilized and restored per the requirements of Section 32 9219, Seeding, or Section 32 9223, Sodding.

3.08 Testing

During the course of the Work, the ENGINEER may require testing for compaction or density of the backfill. The taking of samples and the testing required shall be performed by a testing laboratory approved by the ENGINEER. The cost for testing and sampling shall be at the expense of the OWNER.

The testing laboratory shall furnish the ENGINEER with two (2) certified copies of the results of all tests. Testing procedures shall conform to current MDOT, Standards for Construction.

The maximum unit weight, when used as a measure of compaction or density of soils, shall be understood to mean the maximum unit weight per cubic foot or per cubic meter as determined by ASTM D1557, Method A, for granular materials conforming to MDOT, Class I, and Method D, for granular materials and all other soils.

3.09 Defective Work

Any portion of the backfill which is deficient in the specified density shall be corrected by the methods meeting the approval of the ENGINEER. Any extra testing or sampling required because of apparent deficiencies shall be at the CONTRACTOR's expense.

End of Section

Section 31 2319 Dewatering

Part 1 General

1.01 Scope

This Section includes all dewatering work complete with design of dewatering systems, construction and operation of dewatering systems, abandonment of dewatering systems, protection of personnel and structures, environmental protection and restoration.

1.02 Related Work Specified Elsewhere

1. Unit Prices: Section 01 2200
2. Temporary Erosion and Sediment Control: Section 01 5713
3. Site Construction Performance Requirements: Section 01 8900
4. Structural Excavation and Backfill: Section 31 2316
5. Trenching and Backfilling: Section 31 2333
6. Cast-In-Place Concrete: Section 03 3000

1.03 Design of Dewatering Construction

Any Geotechnical Investigations made in relation to this Project are provided as reference documents. Interpretations of all data and reports, performing any additional investigations, and obtaining any additional data for construction purposes is the responsibility of the CONTRACTOR.

The CONTRACTOR shall be responsible for the complete design of all structures and methods proposed for dewatering the project site, including the implementation of all materials, tools and equipment proposed for use in the Work. Temporary wiring associated with the dewatering shall comply with applicable portions of the National Electrical Code.

Provide monitoring wells as necessary to determine the groundwater levels along the alignment and shaft locations.

1.04 Soil Erosion and Sedimentation Control

All dewatering systems design and construction shall conform to the provisions of Part 91 Soil Erosion and Sedimentation Control, of Act 451 "Natural Resources and Environmental Protection Act" PA 451 of 1994; and Section 01 5713, Temporary Erosion and Sediment Control. Where applicable, the CONTRACTOR shall obtain and pay for all permits and inspections for dewatering construction in accordance with the provisions of PA 451, State of Michigan, 1994, and all local government agencies having jurisdiction. No additional claim for compensation shall be allowed because of the CONTRACTOR's failure to obtain or pay for such permits and inspections.

The CONTRACTOR, at his expense, shall provide, maintain and remove such temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or as determined by the ENGINEER. The measures shall prevent surface runoff from carrying excavated materials into the waterways, to reduce erosion of the slopes, and to prevent silting in of waterways downstream of the Work. Also, the measures should include provisions to reduce erosion by the wind of all areas stripped of vegetation, including material stockpiles.

1.05 Federal, State, and Local Regulations

Dewatering operations shall conform to the requirements of all federal, state, and local agencies having jurisdiction.

Dewatering water discharged to streams, drains or sewers may require permits from federal, state or local agencies having jurisdiction. The CONTRACTOR shall comply with all water quality requirements prior to discharging dewatering water. The CONTRACTOR shall be responsible for all testing and treatment required to meet water quality requirements prior to discharge. No discharges to sanitary sewers will be allowed without prior approval of local agencies with jurisdiction for the sanitary sewers.

1.06 Protection

Take all steps necessary, during the Work of this Section, to protect surrounding property and adjacent buildings, private water supplies, roads, drains, sewers, structures and appurtenances. Adequate measures shall be taken to protect such property and construction from the effects of the dewatering operations.

1.07 Submittals

Submit detailed plans indicating proposed type and location of dewatering wells, type and location of collection/conveyance piping, and point of disposal of pumped water. Do not begin any dewatering work until submittals and supporting data have been reviewed by ENGINEER.

Dewatering system shall be designed by a professional with a minimum of seven years documented experience in the installation and design of dewatering systems. Submittal shall be signed and sealed by a registered professional engineer, stating that the proposed dewatering method is adequate to perform the required tasks.

Part 2 Products (Not Used)

Part 3 Execution

3.01 General

Provide electrical power from local utility. Provide stand-by power and any other required auxiliary dewatering equipment to assure continuous dewatering capability. Dewatering, where required, shall be continuous. Dewatering will not be stopped during work stoppage without approval of the ENGINEER. Coordinate construction operations to minimize duration and extent of dewatering required.

Dewatering wells are to use properly designed filters to prevent the migration of soil fines into the well.

3.02 Monitoring and Control

During dewatering operations, monitor ground water level with piezometers to ensure the design

or specified groundwater elevation is maintained. Install monitoring wells with screens below the excavation level as required. Install wells at minimum 200-foot intervals located between dewatering wells. Provide access to monitoring wells by ENGINEER.

Modify dewatering operation if geotechnical instrumentation or survey measurements indicates movement of structures, sheeting or embankments, or inability to lower groundwater as specified.

Inspect wells and lines on a daily basis to ensure integrity and watertightness. Keep fittings and connections watertight to ensure release of sulfide to atmosphere from groundwater does not occur.

3.03 Existing Drainage Conditions

Prior to beginning any work, verify in the field the location, type and capacity of all existing drainage facilities and conditions which will affect the Work of this Section. No allowances shall be made for conditions found during the progress of the dewatering operations because of the CONTRACTOR'S failure to verify such conditions.

3.04 Existing Structures and Utilities

The CONTRACTOR shall make field verification of all existing structures and utilities at the site of the Work which are scheduled to remain and which may be affected by the Work of this Section. The CONTRACTOR shall be responsible for any damage to existing structures and/or utilities caused because of his Work and shall repair such damage at his expense to the satisfaction of the ENGINEER or utility owner.

3.05 Drainage of Excavations

The CONTRACTOR shall maintain all finished excavation Work free of water during the preparation of the subgrade and until the completion of the Work. No ground or surface water shall be discharged into any existing sanitary sewer. No unit of Work shall be constructed under water except as otherwise determined by the ENGINEER. Provide and maintain adequate dewatering equipment to remove and dispose of all surface or groundwater entering excavations, trenches or other parts of

the Work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the construction is complete.

All excavations which extend down to or below the static groundwater elevation shall be dewatered by lowering and maintaining the groundwater level beneath such excavations a distance of not less than 12 inches (300 mm) below the bottom of the excavation. Drainage system methods shall not cause any damage to wells or adjacent property. All outlet drainage piping and conduit shall be kept clean and free from sediment. The CONTRACTOR shall be held responsible for the condition of all existing pipes, conduits and structures which he may use for drainage.

3.06 Dewatering Sumps and Pump Wells

Sumps and pump wells used as a part of the dewatering system shall be strongly sheathed and braced to protect the construction while in use. Tops of well casings must be covered to prevent animals and debris from entering and shall be 2 to 3 feet (0.6 to 0.9 m) above ground. Sumps and wells, when abandoned, shall be backfilled and compacted to the satisfaction of the ENGINEER.

3.07 Drilling

Methods used in drilling wells associated with dewatering systems shall be the responsibility of the CONTRACTOR and shall be acceptable to the ENGINEER. Drilling methods shall insure proper placement of well materials and shall not involve displacement of earth formations. Drilling shall be done with first class equipment of proper type and in good condition, acceptable to the ENGINEER.

3.08 Pumping

Equipment for pumping and pumping methods associated with dewatering systems shall be the responsibility of the CONTRACTOR and shall be acceptable to the ENGINEER. The CONTRACTOR shall construct or furnish adequate discharge piping to conduct and dispose of the water so as to prevent damage to existing structures or property. Pumping equipment shall be first class, acceptable to the ENGINEER, of proper type and size for the Work and in good

condition. Provide all anchors and supports for pumping equipment.

3.09 Filling and Grading

Upon completion of dewatering Work for the Project, abandon and/or fill all holes, trenches, ditches and other earth excavations created by the Work of this Section and not scheduled to remain.

Do all filling, backfilling and grading to restore excavations and earth banks to the lines and levels indicated on the Plans and as determined by the ENGINEER. All earth fills shall be compacted to a density equal to that of the surrounding undisturbed earth.

End of Section

Section 31 2333 Trenching and Backfilling

Part 1 General

1.01 Scope

This Section includes open trench construction for utility installation, complete with trenching, sheeting, bracing, bedding, bedding materials, backfilling, backfill materials, and compaction.

1.02 Related Work Specified Elsewhere

1. Temporary Erosion and Sediment Control: Section 01 5713
2. Site Construction Performance Requirements: Section 01 8900
3. Clearing and Grubbing: Section 31 1100
4. Grading: Section 31 2200
5. Structural Excavation and Backfill: Section 31 2316
6. Dewatering: Section 31 2319
7. Water Utility Distribution Piping: Section 33 1100
8. Sanitary Utility Sewerage Piping: Section 33 3000
9. Sanitary Utility Force Mains: Section 33 3400
10. Storm Utility Drainage Piping: Section 33 4100

1.03 Reference Standards

Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications:

ASTM - ASTM International

AASHTO - American Association of State Highway Transportation Officials

MDOT- Michigan Department of Transportation, Standard Specifications for Construction, latest edition

1.04 Test Reports

The testing laboratory shall provide the ENGINEER with two (2) certified copies of the test results of the compaction of the backfill. The testing for compaction and the certification of the test results shall be performed by a testing laboratory approved by the ENGINEER.

1.05 Mix Design

Submit mix designs for any concrete or flowable fill mixtures to be used on the Project. Include certified test results for seven day and 28 day strengths, together with any technical information for admixtures.

1.06 Soil Erosion and Sedimentation Control

The CONTRACTOR, at his expense, shall provide, maintain and remove such temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or as determined by the ENGINEER. The measures shall prevent surface runoff from carrying excavated materials into the drain, to reduce erosion of the slopes, and to prevent silting in of drain downstream of the Work. Also, the measures should include provisions to reduce erosions by the wind of all areas stripped of vegetation, including material stockpiles.

Comply with requirements of Section 01 5713, Temporary Erosion and Sediment Control.

Part 2 Products

2.01 Class II Granular Materials

The Class II granular material gradation shall conform to the grading requirements for granular material Class II, as specified in MDOT, Section 902.07 except as follows. The Class II granular

material shall be natural bank run sand with a maximum size of 1½-inches (38 mm).

2.02 Crushed Stone Bedding

Crushed, angular, natural stone material, meeting the requirements of MDOT 21AA. Crushed concrete and slag are not allowed.

2.03 Concrete

The concrete shall conform to MDOT, Section 701, use grade S3; 3,000 psi (21 MPa) strength; Type I-A cement; 5.5 sacks cement per cubic yard (307 kg/m³); 6A coarse aggregate; 2NS fine aggregate; 6.5% ± 1.5% air content; 3-inch (75 mm) maximum slump; no admixtures without ENGINEER's review.

2.04 Flowable Fill for Backfilling

A. Materials

Fly Ash: Fly Ash shall have a maximum loss on ignition of 12% and meet the other requirements of ASTM C618 (Class F).

Water: Water shall meet the requirements of ASTM C94.

Cement: ASTM C150 or C595, Type I or IA.

B. Mixture (Strength 100 – 120 psi, (690 – 825 kPa))

Fly Ash: 2000 lbs/c.y. (1190 kg/m³) min

Cement: 70 lbs/c.y. (40 kg/m³) min

Water: Sufficient water to produce desired flowability, 700 lbs/c.y. (415kg/m³) ±

The temperature of the flowable fill mix as manufactured and delivered shall be at least 50° F (10° C). The flowable fill can be mixed by pugmill, central concrete mixer, ready mix truck, turbine mixer, or other acceptable equipment or method.

Part 3 Execution

3.01 Dewatering

The area within the vicinity of the trenching operation shall be dewatered in accordance with Section 31 2319, Dewatering prior to the trenching operation. The depth of the dewatering shall be sufficient to allow the trench excavating operation including backfilling and compacting to proceed in a dry condition.

3.02 Trench Excavation

Open cut trench excavation shall include the site clearing and grubbing, the excavating of all materials encountered, the supporting and protecting of all structures and/or utilities encountered above and below the ground surface, and the removal of water from the construction site.

The trenching operation shall commence at the downstream or outlet end of the new Work and proceed upstream, unless otherwise specified on the Plans or directed by the ENGINEER.

The trench shall be excavated in reasonably close conformity with the lines and grades specified on the Plans or as established by the ENGINEER.

The excavated materials shall be temporarily stored along the trench in a manner that will not cause damage to trees, shrubs, fences, improvements, utilities, private property, public property or traffic. The excavated materials shall not be placed at such locations that will endanger the trench banks by imposing loads thereon.

The trench shall be of sufficient width to provide adequate working space to permit the installation of the pipe and the compaction of the bedding material under and around the pipe. However, for rigid pipe, the width of the trench from below the pipe bedding to 12 inches (300 mm) above the top of the pipe shall not exceed the following dimensions:

6-inch thru 12-inch pipe (150 thru 300 mm)	30 inches wide (750 mm)
15-inch thru 36-inch pipe (375 thru 900 mm)	outside diameter plus 16 inches (400 mm)
42-inch thru 60-inch pipe (1050 thru 1500mm)	outside diameter plus 20 inches (500mm)
over 60-inch pipe (1500mm)	outside diameter plus 24 inches (600 mm)

To support the additional load of the backfill when the maximum trench width as specified for rigid pipe is exceeded, the CONTRACTOR shall install, at his expense, concrete encasement which shall completely surround the pipe and shall have a minimum thickness at any point of 1/4 of the outside diameter of the pipe or four (4) inches (100mm), whichever is greater, or at his expense, install another type bedding, approved by the ENGINEER. The concrete encasement shall consist of 3,000 psi (21 MPa) strength concrete.

For flexible pipe, the minimum width shall be not less than the greater of either the pipe outside diameter plus 16 in. (400 mm) or the pipe outside diameter times 1.25, plus 12 in. (300 mm). The maximum trench width for flexible pipe shall not exceed the minimum width by more than 6-inches.

To support the additional load of the backfill when the maximum trench width as specified for flexible or semi-rigid pipe is exceeded, the CONTRACTOR shall install, at his expense, crushed stone pipe bedding to the full width between undisturbed trench walls or at least 2.5 pipe diameters on each side of the pipe.

When, through the CONTRACTOR's construction procedure or because of unsuitable existing ground conditions, it becomes impossible to maintain alignment and grade properly, the CONTRACTOR, at his expense, shall excavate below the normal trench bottom grade and shall fill the void with a large size aggregate or 3,000 psi (21 MPa) concrete as approved by the ENGINEER to insure that the pipe when laid in the proper bedding will maintain correct alignment and proper grade.

All trench excavations, including those for shafts and structures, shall be adequately braced and/or sheeted where necessary to prevent caving or squeezing of the soil.

3.03 Sheeting, Shoring, and Bracing

The CONTRACTOR shall furnish, place and maintain at all times such sheeting, shoring, and bracing of the trench and/or shaft as may be required for safety of the workmen and for protection of the new Work or adjacent structures, including pavement, curbs, sidewalks, pipe lines, conduits next to or crossing the trench, and the protection and safety of pedestrian and vehicular traffic.

The CONTRACTOR shall be responsible for the complete design of all sheeting, shoring and bracing Work. The design shall be appropriate for the soil conditions, shall be of such strength, quality, dimension and spacing as to prevent caving or loss of ground or squeezing within the neat lines of the excavation, and shall effectively restrain movement of the adjacent soil. Prior to installing the sheeting, shoring or bracing, the CONTRACTOR shall submit Plans for this Work to the ENGINEER for informational purposes only.

Sheeting, shoring, bracing, and excavation shall conform to the current federal or state regulations for safety.

Where indicated on the Plans and where necessary in the Work, install and leave sheeting, shoring, and bracing in place. No extra compensation shall be paid to CONTRACTOR for sheeting, shoring or bracing left in place.

Supports for pipes, conduits, etc., crossing the trench shall conform to the requirements of the owners of such facilities, and if necessary, shall be left in place.

The furnishing, placing, bracing, maintaining, and removing of sheeting, shoring, and trenching materials shall be at the CONTRACTOR's expense. The CONTRACTOR shall not remove the trench sheeting, shoring and bracing unless the pipe has been properly bedded, and the trench backfilled to sufficiently support the external loads. Also the sheeting, shoring, and bracing material shall not come in contact with the pipe, but shall be installed so that no concentrated loads or horizontal thrusts are transmitted to the pipe.

3.04 Pipe Bedding

Install and compact in six inch layers. Particular care shall be taken to assure filling and tamping all spaces under, around, and above the top of the pipe. Work in and around pipe by hand to provide uniform support.

A. Rigid Pipe Bedding

Rigid pipe bedding shall conform to ASTM C12, except as noted.

Class R-A

The pipe shall be bedded in crushed stone bedding material placed on the trench bottom. The bedding shall have a minimum thickness beneath the pipe of four (4) inches (100 mm) or 1/4 of the outside diameter of the pipe, whichever is greater, and shall extend up the sides of the pipe to the horizontal centerline. The top half of the pipe shall be covered with a monolithic plain concrete arch having a thickness of at least four (4) inches (100 mm) or 1/4 of the inside diameter of the pipe, whichever is greater, at the pipe crown and a minimum width equal to the outside diameter of the pipe plus eight (8) inches (200 mm) or 1-1/4 of the diameter of the pipe, whichever is greater.

Class R-B

The pipe shall be bedded in crushed stone bedding material placed on the trench bottom. The bedding shall have a minimum thickness beneath the pipe of four inches (100 mm) or 1/8 of the outside diameter of the pipe, whichever is greater, and shall extend up the sides of the pipe to the horizontal centerline. Backfill from pipe horizontal centerline to a level not less than 12 inches (300 mm) above the top of the pipe shall be Class II granular material. This material shall be placed in 6-inch (150 mm) layers with each layer thoroughly compacted by mechanical means with the finished compacted material a minimum of 12 inches (300 mm) above the top of pipe.

Class R-C

The pipe shall be bedded in Class II granular material, placed on the trench bottom. The bedding shall have a minimum thickness beneath the pipe of four (4) inches (100 mm) or 1/8 of the outside diameter of the pipe, whichever is greater, and the bedding shall extend to a level not less than 12 inches (300 mm) above the top of the pipe. This material shall be placed in 6-inch (150 mm) layers with each layer thoroughly compacted by mechanical means with the finished compacted material a minimum of 12 inches (300 mm) above the top of pipe.

B. Flexible Pipe Bedding

Flexible pipe bedding shall conform to ASTM D2321, except as noted. A continuous and uniform bedding shall be provided in the trench for all buried pipe.

Class F-I

The pipe shall be bedded in crushed stone bedding material placed on the trench bottom. The bedding shall have a minimum thickness beneath the pipe of four (4) inches (100 mm), and shall extend up the sides of the pipe until the top of pipe is covered by a minimum thickness of 12 inches (300 mm).

Where allowable trench widths are exceeded, Class F-I bedding shall be used to the full width between undisturbed trench walls. Concrete cradle bedding shall not be used.

Class F-II

The pipe shall be bedded in crushed stone bedding material placed on the trench bottom. The bedding shall have a minimum thickness beneath the pipe of four (4) inches (100 mm), or 1/8 of the outside diameter of the pipe, whichever is greater, and shall extend up the sides of the pipe to the horizontal centerline. Backfill from pipe horizontal centerline to a level not less than 12 inches (300 mm) above the top of the pipe shall be Class II granular material. This material shall be placed in 6-inch (150 mm) layers with each layer thoroughly compacted by mechanical means with the finished compacted material a minimum of 12 inches (300 mm) above the top of pipe.

Where allowable trench widths are exceeded, Class F-I bedding shall be used to the full width between undisturbed trench walls. Concrete cradle bedding shall not be used.

Class F-III

The pipe shall be bedded in Class II granular material, placed on the trench bottom. The bedding shall have a minimum thickness beneath the pipe of four (4) inches (100 mm) or 1/8 of the outside diameter of the pipe, whichever is greater, and the bedding shall extend to a level not less than 12 inches (300 mm) above the top of the pipe. This material shall be placed in 6-inch (150 mm) layers with each layer thoroughly compacted by

mechanical means with the finished compacted material a minimum of 12 inches (300 mm) above the top of the pipe.

Where allowable trench widths are exceeded, Class F-I bedding shall be used to the full width between undisturbed trench walls. Concrete cradle bedding shall not be used.

3.05 Backfilling Trenches

Backfill material shall be placed on sections of bedded pipes only after such pipe bedding and backfill materials have been approved by the ENGINEER.

The trench backfilling shall follow the pipe laying as closely as possible. However, at no time shall the pipe laying in any trench precede backfilling of that trench by more than 100 feet (30 m), unless otherwise directed by the ENGINEER.

Backfilling shall not be done in freezing weather except by permission of the ENGINEER. Frozen materials shall not be used in trench backfilling.

The following trench backfill specifications are for use in that portion of the trench beyond the scope of the pipe bedding requirements which normally stops at a point 12 inches (300 mm) above the top of pipe. Backfill material to be placed above pipe bedding shall be free of cinders, ashes, refuse, boulders, roots, stumps, trees, timbers, brush, debris, or other extraneous materials which in the opinion of the ENGINEER, are unsuitable. Rocks or stones having a dimension larger than six (6) inches (150 mm) shall not be placed within three (3) feet (1 m) of the top of the pipe. Large stones may be placed in the remainder of the trench backfill only if well separated and arranged so that no interference with backfill settlement will result.

The type and method of backfilling is dependent on its location and function and shall conform to the following requirements:

Trench "B"

Trenches under road surfaces, pavement, curb, driveway, sidewalk and where the trench edge is within three (3) feet (1m) of the pavement and as noted on the plans shall be backfilled with natural bank run sand meeting the requirements of Class II granular material,

unless otherwise indicated on the Plans. The material shall be placed in uniform layers that can be adequately compacted and tested from the surface of that layer and shall be compacted to 95% of the materials maximum unit weight. Trenches under pavement to be constructed in the near future, as noted or shown on the Plans, shall be backfilled with natural bank run sand, meeting the requirements of Class II granular material, unless otherwise indicated on the Plans, as herein provided.

Where a pipe is installed under an existing or proposed utility, the backfill between the two shall be natural bank run sand meeting the requirements of Class II granular material, unless otherwise indicated on the Plans, constructed as herein specified.

Trench "A"

All other trenches shall be backfilled with suitable excavated material placed in uniform layers that can be adequately compacted and tested from the surface of that layer. Each layer shall be thoroughly compacted by approved mechanical methods to a density equivalent to the undisturbed adjacent soil or 90% of its maximum unit weight which ever is less.

Unless otherwise specified on the Plans or as directed by the ENGINEER, the trench backfill shall be carried to the adjacent existing ground.

Where any backfill or bedding as shown on the plans or specified is to be flowable fill, care shall be used to avoid displacing any pipes or structures due to fluid pressure. Pipes in backfill areas may need to be secured to avoid the bouyancy effect.

3.06 Compacting Trench "B" Backfill

Trench "B" backfill shall be compacted to 95% of the maximum unit weight, unless otherwise specified on the Plans or authorized by the ENGINEER.

Compaction of the backfill will not be paid for separately, but shall be considered incidental to the Work of backfilling and shall include all the Work of manipulating the soil, to obtain the specified densities. No additional compensation

will be allowed for any delay required to obtain the specified moisture content or the specified density.

3.07 Cleanup

Immediately following the placing and compacting of the backfill, the excess material shall be removed and disposed of by the CONTRACTOR, at his expense, as specified in Section 01 8900, Site Construction Performance Requirements. The construction area shall be leveled and left in a neat workmanlike condition.

At a seasonally correct time, approved by the ENGINEER, the disturbed area shall be raked, having topsoil placed thereon, fertilized and seeded per the requirements of Section 32 9219, Seeding, or sodded in accordance with Section 32 9223, Sodding.

3.08 Field Testing

During the course of the Work, the ENGINEER may require testing for compaction or density of the backfill. The taking of samples and the testing required shall be performed by a testing laboratory suitable to the OWNER and approved by the ENGINEER. The cost for testing and sampling shall be at the expense of the OWNER.

The maximum unit weight, when used as a measure of compaction or density of soils, shall be understood to mean the maximum unit weight per cubic foot or per cubic meter as determined by ASTM D1557, Method D.

3.09 Defective Work

Any portion of the trench backfill which is deficient in the specified density shall be corrected by methods meeting the approval of the ENGINEER.

Any extra testing or sampling required because of deficiencies shall be at the CONTRACTOR's expense.

End of Section

Section 31 3500 Slope Protection

Part 1 General

1.01 Scope

This Section includes plain riprap, grouted riprap, concrete slope paving, precast concrete block slope paving, interlocking precast concrete slope paving, grouted flagstone, preseeded erosion control blankets, wire mesh gabions, precast concrete grid slope pavers, geotextile filter fabric, and concrete bag slope protection.

1.02 Related Work Specified Elsewhere

1. Unit Prices: Section 01 2200
2. Temporary Erosion and Sediment Control: Section 01 5713
3. Site Construction Performance Requirements: Section 01 8900
4. Mortaring and Grouting: Section 04 0511
5. Seeding: Section 32 9219
6. Sodding: Section 32 9223

1.03 Reference Standards

Unless otherwise specified, the Work of this Section shall conform to the applicable portions of the following Standard Specifications:

ASTM-	ASTM International
Fed. Spec.-	Federal Specifications
MDOT-	Michigan Department of Transportation, Standard Specifications for Construction, latest edition.
USDC (NBS)-	U.S. Department of Commerce, National Bureau of Standards

1.04 Submittals

A. Manufacturer's Literature

Submit manufacturer's literature describing materials and fabrication methods for the type of geotextile filter fabric, wire mesh gabions, precast concrete slope pavers, preseeded erosion control blankets and precast concrete grid pavers proposed for use in the Work.

B. Samples

Submit samples of the types of geotextile filter fabric proposed for use in the Work to the ENGINEER.

C. Shop Drawings

Submit Shop Drawings of wire mesh gabions showing wire sizes, finishes, fabrication, assembly and erection methods for all wire mesh gabions proposed for use in the Work.

1.05 Product Delivery, Storage, and Handling

A. Geotextile Filter Fabric

During delivery, storage, and handling, geotextile filter fabric shall be wrapped in a heavy duty covering which will protect the fabric from direct sunlight, ultraviolet rays, temperatures greater than 140 degrees F, mud, dirt, dust, debris and the elements.

B. Wire Mesh Gabions

When polyvinyl chloride coated wire mesh gabions are used in the Work, these units shall be protected against freezing temperatures during delivery, storage, handling, also damage to PVC coating.

1.06 Job Conditions

A. Temperature

Comply with the requirements for placing slope protection materials due to outside ambient air temperatures as specified under Article 3.06 of this Section.

B. Subbase Conditions

Comply with the requirements for placing slope protection materials on prepared subbase because of frost and freezing conditions as specified under Article 3.06 of this Section.

C. Slope Protection Materials

Comply with the requirements for protection of slope protection materials during curing periods as described under Article 3.06 of this Section.

1.07 Soil Erosion and Sedimentation Control

The CONTRACTOR, at his expense, shall provide, maintain and remove such temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or as determined by the ENGINEER. The measures shall prevent surface runoff from carrying excavated materials into the drain, to reduce erosion of the slopes, and to prevent silting in of drain downstream of the Work. Also, the measures should include provisions to reduce erosions by the wind of all areas stripped of vegetation, including material stockpiles.

Comply with requirements of Section 01 5713, Temporary Erosion and Sediment Control.

Part 2 Products

2.01 Form Work

Forms for concrete shall be metal or wood. All forms shall be straight, free from warps and of sufficient strength to resist springing during depositing of the concrete against the form surfaces.

2.02 Concrete

In accordance with MDOT Section 701, use Grade S2; 3,500 psi strength (24 MPa); Type IA cement; 6.0 sacks cement per cubic yard (335 kg/m³); 6A coarse aggregate; 2NS fine aggregate; 6.5% + 1.5% air content; 3-inch (75 mm) maximum slump; no admixtures without the ENGINEER's approval.

2.03 Concrete Reinforcement

In accordance with MDOT Section 905, use ASTM A615, Grade 60 for bars and ASTM A185 for welded wire fabric.

2.04 Membrane Curing Compound

Curing compound shall be a transparent membrane type material conforming to ASTM C309, Type I, Class B vehicle. Test for moisture retention, reflectance and drying time, when performed, shall be based on a curing compound application rate of one (1) gallon per 200 square feet (4 l per 20 m²) of surface.

2.05 Stone Riprap

Stone for riprap shall be sound, tough, durable rock, free from structural defects. Stone shall be a minimum of 8-inches (200 mm) thick measured perpendicular to the slope, with a least surface dimension of 12 to 16-inches (300 to 400 mm) measured parallel to the slope. Maximum to minimum ratio shall not exceed 3:1.

2.06 Concrete Riprap

Sound pieces of broken concrete free of soil, protruding reinforcing steel, bituminous and other similar materials, with a minimum thickness of 8-inches (200 mm) and a least surface dimension of 12 to 16-inches (300 to 400 mm) measured parallel to the slope. Maximum to minimum ratio shall not exceed 3:1.

2.07 Precast Concrete Block

Precast concrete block shall be factory cast concrete units of the sizes indicated on the Plans. Precast concrete block shall attain a minimum compressive strength of 3,000 psi (24 MPa) in 28 days and have a maximum water absorption rate of ten (10) pounds per cubic foot (160 kg/m³) when tested in accordance with ASTM C140 with the following exceptions:

A. Compressive Strength

Compression test specimens having surface dimensions of 4" x 4" inches (100 mm x 100 mm) will be sawed from the units. The specimen will be tested with the load applied in the direction of the unit thickness.

B. Absorption

The amount of absorption of water shall be determined on half of the same unit from which the compression test specimen was sawed.

2.08 Precast Concrete Grid Slope Pavers

Precast concrete grid slope pavers shall conform to the minimum physical properties listed below:

Length	23 inches (580 mm)
Width	15 inches (380 mm)
Thickness	4 inches (25 mm)
Area, Gross	345 in ²
Area, Upper Surface	95 in ² (600 cm ²)
Area, Base Surface	326 in ² (2100 cm ²)
Bearing Capacity	100 lb./sq.ft. (490 kg/m ²)
Strength, Compressive	4,000 psi (28 MPa)

2.09 Interlocking Precast Concrete Slope Pavers

Interlocking precast concrete slope pavers shall be composed of precast concrete blocks which interlock together either through a mechanical system or through the design of the blocks themselves. The blocks shall be laid on a geotextile fabric.

The precast concrete block units shall have the following minimum properties:

Compressive Strength	2,500 psi (17 MPa)
Weight	25 lbs/sft (125 kg/m ²)
Thickness	4 inches (100 mm)

The system when assembled shall have a minimum of 20% open area suitable for sustaining vegetation.

The geotextile fabric shall be either a woven or nonwoven polypropylene with apparent opening size per ASTM D4751 of less than 0.6 mm.

The mechanism for interlocking the precast concrete units shall be noncorrosive and suitable for its intended use.

2.10 Preseeded Erosion Control Blankets

Soil erosion control blankets shall be a 70 percent straw, 30 percent coconut fiber matrix sewn between two UV stabilized nets, with a cellulose fiber bottom tissue. The blanket shall be composed of:

- straw .35 lbs/syd (.20 kg/m²)min
- coconut fibers .15 lbs/syd (.08 kg/m²)min

The roll shall be a minimum 6.5 feet (2 m) wide. The blanket shall contain a seed mixture. The seed mixture shall consist of:

- kentucky blue grass 50 percent
- red top 10 percent
- rye grass 35 percent
- clover 5 percent

The seed mixture shall also conform to Section 32 9219, Seeding. The preseeded erosion control blankets shall be North American Green cell-o-seed, SC150, or ENGINEER approved equal.

2.11 Flagstone

Flagstone shall be sound, tough, durable limestone or seasoned sandstone slabs, free from structural defects. Flagstone shall be irregular shaped units of the thickness indicated on the Plans. The aggregate sizes of individual flagstone units incorporated in the overall flagstone work shall be as follows:

- 25%Approximately 64 in² (400 cm²)
- 50%Approximately 144 in² (925 cm²)
- 25%Approximately 324 in² (2100 cm²)

2.12 Stone Fill for Gabions

Stone fill used in gabion units shall be sound, tough, durable aggregate with a minimum size of four (4) inches (100 mm) based on U.S. Standard square mesh sieves. Stone shall be free of cracks, seams, and other defects that would unduly increase deterioration of the material from natural causes or reduce its size. The inclusion of objectionable quantities of dirt, sand, clay, and rock fines as determined by the ENGINEER will not be permitted. Sound pieces of broken concrete, without protruding reinforcement, may be used in place of stone where approved by the ENGINEER.

2.13 Wire Mesh Gabions

A. Galvanized Steel Wire Mesh Gabions

Gabion basket units shall be of nonraveling construction and fabricated from a triple twisted hexagonal mesh of hot dipped galvanized steel wire having a minimum diameter of 0.118 inches (3 mm) after galvanization. The steel wire used shall be galvanized prior to fabrication into mesh. All

gabion diaphragm and frame wire shall equal or exceed Federal Specification QQ-W-461g, possess medium tensile strength, and a Finish 5, Class III zinc coating of not less than 0.80 oz/sq. ft. (244 g/m²) of uncoated wire surface. The test for weight of zinc coating shall be as determined by ASTM A90. The uniformity of coating shall equal or exceed four, 1-minute dips by the Preece Test; ASTM A239.

Mesh openings shall be hexagonal in shape, and uniform in size measuring not more than 3-1/4" x 4-1/2" (80 mm x 115 mm). Selvedge or perimeter basket frame wire shall be of heavier gage than the wire mesh with a minimum diameter after galvanizing of 0.150 inches (4 mm). Wire used for lacing or as internal connecting wire within basket cells may be of soft tensile strength and of lighter gage with a minimum diameter after galvanizing of 0.0866 inches (2 mm).

B. Polyvinyl Chloride (PVC) Coated Galvanized Steel Wire Mesh Gabions

Polyvinyl chloride coated gabion basket units shall be of unraveling construction, fabricated from a triple twisted hexagonal mesh of hot dipped galvanized steel wire having a minimum diameter of 0.105 inches (3 mm) after galvanizing and additionally coated with a minimum of 0.020 inches (.5 mm) of PVC. The steel core wire used shall be galvanized and PVC coated prior to fabrication into mesh. The core wire of all gabion diaphragm and frame components shall equal or exceed Federal Specification QQ-W- 461g, shall possess medium tensile strength, and a Finish 5, Class III zinc coating of not less than 0.80 oz/sq. ft. (245 g/m²) of uncoated wire surface.

Mesh openings shall be hexagonal in shape and uniform in size measuring not more than 3-1/4" x 4-1/2" (80 mm x 115 mm). Selvedge or perimeter basket frame core wire shall be of heavier gage than that of the wire mesh with a minimum diameter after galvanization of 0.132 inches (3 mm), and an overall diameter (core wire plus PVC coating) of 0.174 inches (4 mm). Coated wire used for lacing or as internal connecting wire within basket cells may be of soft tensile strength and an overall diameter (core wire plus PVC coating) of 0.127 inches (3 mm). The PVC coated wire of all

gabion components shall be resistant to the destructive effects of immersion in acidic, salt, or polluted water, exposure to ultraviolet light and abrasion, and retain these characteristics after a period of not less than 3,000 hours under test in accordance with ASTM G23.

C. Fabrication

Gabions shall be fabricated in such a manner that they can be assembled at the construction site into rectangular baskets of the sizes specified and shown on the Plans. Gabions shall be of single unit construction. The gabion base, lid, ends, and sides shall be either woven into a single unit or one edge of these members connected to the base section of the gabion in such a manner that strength and flexibility at the point of connection is at least equal to that of the mesh. Where the length of the gabion exceeds 1-1/2 its horizontal width, the gabion shall be equally divided by diaphragms of the same mesh and gauge as the body of the gabions, into cells whose length does not exceed the horizontal width. The gabion shall be furnished with the necessary diaphragms secured in proper position on the base in such a manner that, during assembly, no additional tying will be necessary. All perimeter edges of the mesh forming the gabion shall be securely selvedged so that the joints formed by tying the selvedges have at least the same strength as the body of the mesh. Lacing wire or connecting wire shall be supplied in sufficient quantity for securely fastening all diaphragms and edges of the gabion.

2.14 Geotextile Filter Fabric

Geotextile filter fabric material shall be a non-woven, needle punched fabric consisting of compositions of at least 85% by weight polyolefins, polyesters, or polyamides. The geotextile filter fabric shall be resistant to chemical attack, rot and mildew and shall have no tears or defects which adversely alter its physical properties. The fabric shall conform to the following physical strength requirements:

<u>Physical Property</u>	<u>Test Procedure</u>	<u>Acceptable Test Results</u>
Tensile Strength	ASTM D4632	120 pound min.
CBR Puncture Strength	ASTM D6241	300 pound min.
Elongation	ASTM D4632	50% minimum
Trapezoid Tear	ASTM D4533	50 pounds min.
Permittivity	ASTM D4491	1.7 sec ⁻¹ min.
Ultraviolet Degradation	ASTM D4355	70% of min Degradation strength retained after weathering for 500 hours
Apparent Opening Size	ASTM D4751	70 U.S. Sieve

The seams of the fabric shall be sewn with thread of a material meeting the chemical and physical requirements listed above or shall be heat or cement bonded. The strength of seams shall be not less than 90% of the required tensile strength of the filter fabric in any principle direction.

2.15 Burlap Bags

Bags shall have maximum dimensions of 18" x 24" (450 mm x 600 mm) and shall be made of ten (10) ounce burlap.

2.16 Acceptable Manufacturers

A. Grid Pavers

Acceptable manufacturers of turf and soil concrete grids include: "Mono Slabs" as distributed by Fendt Builders Supply, Inc., or equal.

B. Gabions

Acceptable manufacturers include: Maccaferri Gabions, Inc.; Bekaert Steel Wire Corp.; or equal.

C. Interlocking Precast Concrete Slope Pavers

Unless indicated otherwise on the plans, acceptable manufacturers include: Tri-lock erosion control system by American Excelsior Company; Flexblock Armored Stabilization

Mattress by Earthbase Construction Products or ENGINEER approved equal.

Part 3 Execution

3.01 Verification of Subbase

A. Riprap and Slope Paving Materials

Prior to the installation of any riprap or paving materials, examine the subbase to receive such material for the proper grades and lines required to receive the Work. Ascertain that all subgrades and bedding are adequate to receive slope protection. Correct all defects and deficiencies before proceeding with the Work.

B. Geotextile Filter Fabric

Prior to installation of any geotextile filter fabric, verify that the surfaces to receive fabric are prepared to relatively smooth grades, free of obstructions, depressions, debris and soft or low density pockets of material. Correct all defects and/or deficiencies prior to installation of fabric so that fabric will not be damaged.

3.02 Preparation - General

Prepare all surfaces to receive slope protection materials as indicated on the Plans and as specified below.

3.03 Bedding Materials

Install all bedding materials of the types indicated on the Plans and as required to receive the slope protection materials. Remove any buried debris protruding through the bedding material that will impede or damage the proper installation or affect the final appearance of the slope protection installations. Fill all voids of installed bedding materials and compact as directed by the ENGINEER.

3.04 Examination of Materials

A. Geotextile Filter Fabric

Prior to installation, inspect all geotextile filter fabric for defects, rips, holes, contamination or deterioration. Replace all defective geotextile filter fabric as directed by the ENGINEER.

B. Wire Mesh Gabions

Prior to installation, inspect all galvanized and/or PVC coated wire mesh gabions for defects or damage due to manufacture, handling or storage which would substantially affect gabion installation and performance. Replace all defective or damaged wire mesh gabions as directed by the ENGINEER.

3.05 Installation General

Material for bedding, where required, shall be spread uniformly on the prepared subbase to the slopes, lines, levels and grades indicated on the Plans in a manner satisfactory to the ENGINEER.

Bedding methods shall not cause segregation of bedding material particle sizes or damage to prepared subbase. Repair all defective or damaged work to the satisfaction of the ENGINEER. Bedding shall be compacted and finished to present a reasonably even surface, free from mounds or wind rows.

Install formwork for concrete headers, cast-in-place concrete slope paving and weep holes for riprap paving where indicated on the Plans. Forms shall be the full depth of the concrete. Forms shall be firmly staked to the required line and grade. Slab division forms shall be placed so that the slab division joints are straight and continuous.

3.06 Concrete Slope Paving

Construct concrete slope paving on the prepared subgrade to the lines and levels and according to the details indicated on the Plans. The prepared subgrade shall be thoroughly wetted and the concrete deposited to the proper depths. The concrete shall be placed in blocks having dimensions indicated on the Plans. Place concrete in alternate blocks. Pour remaining blocks after first blocks are placed.

No concrete shall be placed unless the temperature of the air away from artificial heat is at least 25 degrees F (4° C) and rising, unless otherwise allowed by the ENGINEER. Place no concrete against frost or frozen materials. Concrete shall not be placed when the temperature of the concrete at the point of placement is above 90 degrees F (32° C). Thoroughly spade concrete along the faces of forms before finishing operations are started.

Alternately tamp and strike off concrete with a strike board until all voids are removed and the surface reaches the required grade and cross section.

Finish the concrete surfaces with a wood float. Round all edges and joints to a radius of 1/4 inch with an approved finishing tool.

The concrete shall be cured for a minimum of four days by being kept continuously wet or by the application of transparent membrane curing compound. Protect the concrete from freezing until the concrete has attained at least 100 psi (0.7 MPa) flexural strength. Protect concrete against foot traffic for a minimum of 24 hours.

3.07 Concrete Headers

Construct cast-in-place concrete toe and side headers of the types, sizes and to the lines and levels indicated on the Plans. Placing, curing and protection of concrete headers shall be as described above under Article 3.06, Concrete Slope Paving.

3.08 Geotextile Filter Fabric

Place geotextile filter fabric on the prepared subbase in the manner and at the locations shown on the Plans. Fabric shall be laid smooth and free of tension, stress, folds, wrinkles or creases. The fabric strips shall be placed to provide a minimum overlap of 24 inches (600 mm) for each joint. Install securing pins with washers through both strips of overlapped fabric along a line through the midpoint of the overlap at center-to-center spacings as recommended by manufacturer unless otherwise indicated on the Plans. Washers shall bear against fabric to secure firmly to subbase. Additional pins shall be installed as necessary to prevent slippage of the filter fabric. Securing pins shall be steel, 3/16 inch (5 mm) minimum size, pointed at one end, of lengths as recommended by manufacturer unless otherwise indicated on the Plans, but not less than 18 inches (450 mm) long. Washers shall have an outside diameter of not less than 1-1/2 inches (40 mm).

Fabric shall be placed so that the upper strip will overlap the next lower strip. Schedule the Work so that fabric is covered with slope protection materials specified within seven days after fabric placing. Failure to comply shall require

replacement of fabric. Filter fabric shall be protected from damage by limiting the height of drop of slope protection material or by placing a cushioning layer of sand on top of fabric before placing other material.

3.09 Aggregate Filter Drainage Layers

Install aggregate filter drainage layers in the locations and to the lines and levels indicated on the Plans. Gradation of aggregate for filter drainage layers shall be as detailed. Spread and compact aggregate as indicated.

3.10 Precast Concrete Slope Paving

Unless otherwise specified, the precast concrete slope paving shall be laid on a prepared subbase as indicated on the Plans. Units shall be laid beginning at toe of slopes. Joints shall be as detailed and shall be filled with mortar. Edges of precast units shall be moist when the mortar is placed. Mortar shall be placed from bottom to top and sufficient mortar shall be used to construct solid joints. Mortar shall be worked with suitably approved tools to completely fill the joints between the units. Excess mortar shall be removed from the surface of the precast concrete units. Precast concrete slope paving shall be cured and protected as specified under Article 3.06 of this Section, Concrete Slope Paving.

3.11 Plain Riprap Slope Paving

Stone for riprap shall be placed on the prepared subbase commencing at the toe of the slope and progressing upward; each stone being laid by hand. Stone shall be placed in a manner as to produce a reasonably well graded mass with a minimum practicable percentage of voids. Riprap along the lower edge of an area shall consist of the largest stones. Except for small stones used to fill voids between larger stones, no stone shall be used in the exposed face of the riprap which will extend less than 1/2 the riprap thickness, and shall be placed within the tolerances and to the lines and levels shown on the Plans. Riprap shall be placed to a full course thickness in one operation and in a manner to avoid displacement of subbase. The larger stones shall conform to the gradation indicated on the Plans and be well distributed over the area. Rearranging of individual stones will be required as necessary to obtain a reasonably well graded distribution of stone sizes.

The riprap and bedding shall be thoroughly compacted as the construction progresses to provide an even, tight surface. Riprap protection shall be placed as a part of the embankment and with minimum lag in construction of riprap to prevent mixture of embankment and stone protection material.

3.12 Grouted Riprap Slope Paving

Stones for grouted riprap shall be laid as specified above for plain riprap. Riprap shall be carefully placed in the prepared subbase to the lines and levels indicated on the Plans, with the joints between the stones left open to receive the grout. Where indicated on the Plans, construct weep holes in the riprap by placing approved forms on the subbase and placing the riprap around the forms. Weep holes shall be filled with the material used for bedding of riprap and, during the grouting work, care shall be taken to prevent mortar from entering the weep holes.

Prior to grouting, all surfaces of the riprap shall be thoroughly wetted. The riprap shall be grouted in successive longitudinal strips, approximately ten (10) feet (3 m) in width, starting at the lowest strip and working up the slope. Each batch of mortar shall be placed on the upper portion of the ungrouted portion of the strip and worked into the voids between the stones and down the slopes. Grout shall be distributed over the surfaces of the strips by the use of brooms and worked into place between the stones by the use of spades, trowels, vibrators or other approved equipment. Adequate precautions shall be taken to prevent the grout from penetrating the stone bedding material. Faces of riprap stones shall remain exposed. As a final operation, the grout shall be removed from the top surfaces of the riprap stones and from pockets and depressions in the stone faces by use of a stiff stable broom or brush.

Riprap shall not be grouted when the ambient temperature is below 35 degrees F (2° C) or above 85 degrees F (29° C), nor when the grout, without special protection, is subject to freezing temperatures before final set has occurred. Protect grouted riprap surfaces from rain, flowing water and mechanical injury. No workmen or any load shall be permitted on the grouted riprap surfaces for a period of at least 24 hours.

3.13 Grouted Flagstone Slope Paving

Flagstone shall be placed on prepared subbase to the lines and levels indicated on the Plans. Prior to placing flagstone, the subbase shall be wetted. Placing of flagstone shall begin from the bottom of the slope and proceed upward, in courses, to the top. The stones shall be laid flat with the smoother faces of the stone exposed. Stone shall be laid with well broken joints and a minimum of space between units. The space between flagstone joints shall be swept clean of sand and other materials to the full depth of the stones and filled with mortar. The edges between the stones and the subbase between the stones shall be wetted and the surfaces damp when the mortar is placed. The mortar shall be placed in such a manner as to fill the joints completely to the full depth of the stones, but no mortar shall be left on top of the stones. Each joint shall be filled with mortar individually. Depositing a volume of mortar on top of the stones and sweeping it into the joints will not be permitted. The top surface of the joints shall be finished flush with the stones, and any excess mortar around the joints or on the face surface of the stones shall be removed with a stiff brush or by other approved means.

Grouted flagstone slope paving shall be cured and protected as specified under Article 3.11, Grouted Riprap Slope Paving.

3.14 Precast Concrete Grid Slope Pavers

The grid slope pavers shall be placed on a prepared subbase to the lines and levels indicated on the Plans. Placing of pavers shall begin from the bottom of the slope and proceed upward in courses to the top. The lowermost course of pavers shall be laid with the slab longitudinal members horizontal along the bank, succeeding courses shall be laid to the desired height. Where indicated on the Plans and where necessary, provide and install wooden stakes, of sufficient size, to anchor slabs. Stakes shall be placed at the lowermost paving course and, alternately, two (2) or three (3) slab widths apart. When laying is completed, fill the interstices of the slab grids to within 1-inch (25 mm) of the top with earth fill as specified on the Plans.

3.15 Interlocking Precast Concrete Slope Pavers

Area(s) to receive interlocking precast concrete slope pavers shall be free of obstructions such as tree roots, rocks, or other protruding objects or foreign materials.

Voids or soft areas shall be filled with acceptable material. All areas will be suitably compacted. Where necessary, hand dressing will be required.

Interlocking precast concrete slope pavers shall be laid on a geotextile filter fabric. The installation of the geotextile fabric shall occur in stages. The geotextile shall be spread at a maximum rate of 200-250 square yard (165-210 m²) or that portion of the geotextile fabric which will be covered by block during the work day. Geotextile fabric shall not remain exposed to U.V. for extended period.

Geotextile fabric shall be anchored using 12" x 3/16" (300 x 5 mm) pins with 1-1/2" (40 mm) diameter washer heads. Pins shall be placed at 2-foot (600 mm) intervals on edges of geotextile and at 3-foot (900 mm) intervals on interior areas of geotextile.

An overlap at seams of 24 inches (600 mm) minimum is required.

Upper geotextile sections will overlap.

Installation of interlocking precast concrete slope pavers shall begin with blocks being placed in a straight line perpendicular to the direction of lay and will continue in a sequential manner. As installation continues, straight lines must be maintained.

Key, toe, and flank trenches shall be constructed and backfilled as shown on the plans.

When placement of interlocking precast concrete slope pavers is complete, fill voids in lower five feet of pavers with 21A crushed limestone. Fill voids in remaining pavers with topsoil, seed, fertilizer, and mulch.

3.16 Wire Mesh Gabions

The empty wire mesh gabion units shall be assembled at the site of the Work in strict accordance with the printed instructions of the manufacturer of the gabion units used. No substitution shall be allowed for lacing wire

specified in this Section or that recommended by the wire mesh gabion manufacturer.

Empty gabion units shall be placed on the prepared subbase to the lines, levels and grades indicated on the Plans. Units shall be placed with sides, ends and diaphragms erected to insure the correct position of all creases and that tops of all sides are level. After installation, all adjoining empty gabion units shall be connected by tie wire lacing along the perimeter of their contact surfaces to obtain a monolithic structure. Lacing of adjoining basket units shall be accomplished by continuous stitching with alternating single and double loops at intervals of not more than five (5) inches (125 mm). All lacing wire terminals shall be securely fastened. The use of clip connections to effect final lid closing will not be permitted. After the initial course of baskets are placed, they shall be partially filled with stone to provide anchorage against deformation and displacement during filling operation.

After adjoining empty baskets are set to line and grade, and common sides with adjacent units, thoroughly laced, the units shall be placed in tension and stretched to remove any kinks in the mesh and to bring units to full, uniform alignment.

Stretching of empty basket units shall be done in a manner that will prevent unraveling of wire mesh. For gabion units two (2) feet (600 mm) or more in depth, a minimum of two (2) uniformly spaced connecting wires shall be placed between each stone layer in all cells connecting compartment faces parallel to earth banks.

Connecting wires shall be looped around one mesh opening at each basket face and the wire terminals securely twisted to prevent loosening. For gabion units over four (4) feet (1.2 m) in depth, a minimum of two (2) uniformly spaced vertical connecting wires per cell, linking the foundation mesh to the basket lid mesh shall be provided. The outer layer of stone shall be placed and arranged by hand to insure a neat and compact appearance along all exposed faces. The final layer of stone shall level with the top of the gabion units for proper lid closing. Lids shall be stretched tight over the stone fill using suitable lid closing tools so that the lid meets the perimeter edges of the front and end panels. Tightly lace all edges, ends and internal cell diaphragms.

Turn all wire projections into baskets. Where complete gabion units cannot be installed, cut, fold and wire baskets to suit site conditions.

Proceed carefully with stone filling operations using hand or machine methods which will not damage the wire mesh coatings of the units. Placing methods shall assure a minimum of voids between stones. Alignment of the gabion basket units shall be maintained throughout the filling operation. Undue bulging or localized deformation of the basket units shall be avoided by filling in stages of 12-inch (300 mm) courses. At no time shall any cell be filled to a depth exceeding 1-foot (300 mm) more than adjoining cells. Maximum stone drops shall be three (3) feet (900 mm).

3.17 Concrete Bag Riprap

Bags of unhardened concrete shall be placed as indicated on the Plans, on the prepared subgrade commencing at a concrete base at the toe of the slope and progressing upward. The concrete base shall be no less than 12 inches (300 mm) in width and thickness, with the end of the culvert embedded four (4) inches (100 mm). Concrete, when placed into the bags, shall be wet enough so that when set into place the bags will adhere together to form a solid wall. Bags shall be filled to 2/3 capacity. Steel bars, 1/2 inch (10 mm) diameter and no less than 24 inches (600 mm) long, shall be driven through the top row of bags at 12 inches (300 mm) on center. Protrusion of bars from bags will not be permitted. A 4-inch (100 mm) thick concrete cap shall be placed to the full width and length of the top row of bags. Environmental requirements for the placement of concrete shall comply with Article 3.06 of this Section.

3.18 Field Quality Control

Upon completion of the slope protection, the Work shall be final inspected. The final inspection shall consist of a check to confirm the proper placement and backfill of the protection material, assure slopes and elevations as indicated on the Plans and completion of related earth Work.

End of Section

Section 31 6610 Helical Piles

Part 1 General

1.01 Scope

- A. The purpose of this specification is to detail the furnishing of all designs, materials, tools, equipment, labor and supervision, and installation techniques necessary to install Helical Piles as detailed on the drawings, including connection details. This shall include provisions for load testing that may be part of the scope of work.
- B. This work consists of furnishing all necessary engineering and design services, supervision, labor, tools, materials, and equipment to perform all work necessary to install the Helical Piles, per the specifications described herein, and as shown on the drawings. The Contractor shall install a Helical Pile that will develop the load capacities as detailed on the drawings. This may also include provisions for load testing to verify Helical Pile capacity and deflection, if part of the scope of work.

1.02 Qualifications of Contractor

- A. The Helical Pile Contractor shall be experienced in performing design and construction of Helical Piles and shall furnish all materials, labor, and supervision to perform the work.

1.03 Definitions

- A. Allowable Load: See “Nominal Load” below
- B. Bearing Stratum: Any soil layer which provides a significant portion of the axial load capacity of an installed helical pile by providing resistance to one or more of the pile’s helical plates.
- C. Crowd: Axial compressive force or pressure applied to the helical pile as needed during installation to ensure the pile progresses into the ground a distance approximately equal to the helix pitch per revolution.
- D. Design Load: See “Nominal Load” below.
- E. Extension Section: Helical pile component installed between the lead section and the load transfer device allowing installation of the helix plates to such depth as may be necessary to attain the required load capacity. They may be plain (without helix plates) or (including one or more helix plates). Helical extensions typically follow immediately behind the lead section. Extension shaft ends are adapted to interconnect with helical lead sections, other extension sections and the load transfer device.
- F. Effective Torsional Resistance: The average installation torque typically taken over a distance equal to the last three diameters of penetration of the largest helix plate.
- G. Factored Load: Nominal load times the required load factor (Load Resistance Factor Design) or safety factor (Allowable Stress Design).
- H. Geotechnical Capacity (a.k.a. Ultimate Soil Capacity): The maximum load that can be resisted through the bearing of helix plates on the soil in which they are embedded.
- I. Helical Pile: Consists of
 - 1. One or more helical deformed plates (“helix plates”) attached to a central shaft and
 - 2. Load transfer device for attachment to a structure.

It may also include surface coating or other corrosion protection means. It is installed by screwing into the soil with down pressure (“crowd”), and thereafter resists compressive loads through bearing of the helical plates on the soil in which they are embedded.

- J. Helical Plate: Generally round steel plate formed into a helical spiral and welded to the central steel shaft. When rotated in the ground, the helical shape provides thrust along its longitudinal axis thus aiding in pile installation, plus the plate transfers axial load to the soil through bearing.
- K. Lead Section: The first helical pile component installed into the soil. It consists of one or more helical plates welded to the central steel shaft.
- L. Limit State: A condition beyond which a helical pile component or interface becomes unfit for service and is judged to be no longer useful for its intended function (serviceability limit state) or to be unsafe (strength limit state).
- M. Loads: Forces or other actions that result from the weight of all building materials, occupants and their possessions, environmental effects, differential movement, and restrained dimensional changes. Permanent loads are those loads in which variations over time are rare or of small magnitude. All other loads are variable loads (see also Nominal Load below).
- N. Load Factor: A factor that accounts for deviations of the actual load from the nominal load (Load Resistance Factor Design).
- O. Mechanical Strength: The maximum compressive load that can be resisted by the structural elements of a helical pile.
- P. Nominal Load: The magnitude of the loads determined by the Engineer, which includes dead, live, soil wind, snow, rain, flood and earthquake.
- Q. Reveal: The distance from ground surface to the end of the last installed extension of a pile, measured along the pile’s longitudinal axis.
- R. Safety Factor: The ratio of the ultimate pullout resistance to the nominal load used for the design of any helical pile component or interface (Allowable Stress Design).
- S. Load Test: A procedure to test the capacity and relation of load to movement by applying a compressive load on the helical pile.
- T. Working Load: See “Nominal Load” above.
- U. Ultimate Bearing Resistance: Limit state based on the lesser of mechanical strength or geotechnical capacity of the helical pile defined as the point at which no additional load can be justified.

1.04 Design and Performance Requirements

- A. Helical piles shall be designed to support the nominal compressive load(s) as shown on the project plans. The overall length, helix configuration and minimum effective torsional resistance of a helical pile shall be such that the required geotechnical capacity is developed by the helix plate(s) in an appropriate bearing stratum(s).
- B. Except where noted otherwise on the project plans, all pile components shall be selected to provide a minimum factor of safety against ultimate mechanical resistance of 2.5.
- C. Except where noted otherwise on the project plans, all piles shall be installed to provide a minimum factor of safety against ultimate bearing resistance of 2, piles shall be installed to provide a maximum axial deflection at nominal compressive load of 0.5 inches, and must satisfy the deflection criteria as stated on the plans or drawings.

- D. Except where noted otherwise on the project plans, each pile shall be designed to meet a corrosion service life of 50 years.
- E. The pile design shall take into account such pile spacing, soil stratification, corrosion and strain compatibility issues as are present for the project.
- F. The piles shall be designed such that the maximum test load does not exceed 80% of the manufacturer's rated ultimate mechanical strength of any pile component or load transfer device.

1.05 Placement Requirements

- A. When helical pile placement is shown on the project plans, production piles shall be placed such that the pile head is within 3 inches, and the pile shaft alignment is within 2 degrees of the inclination angle, shown on the project plans. Cutoff elevation shall be within 2" of design. When pile placement is not shown on the project plans, the placements, alignments and their respective tolerances shall be included as part of the design submittal.

1.06 Submittals

- A. The Contractor and/or pile designer shall submit to Engineer the following documentation. Work shall not begin until all the submittals have been received and approved by the Engineer. All costs associated with incomplete or unacceptable submittals shall be the responsibility of the Contractor.
- B. Documents to be submitted:
 - 1. Evidence of Contractor's competence and safety record.
 - 2. Evidence of Contractor's competence in the installation of helical piles shall be provided to the Owner's satisfaction and may include any or all of the following:
 - a. Pile manufacturer's certificate of competency in installation of helical piles, or
 - b. A list of at least three projects completed within the previous three years wherein the Contractor installed helical piles similar to those shown in the project plans, such list to include names and phone numbers of those project owner's representatives who can verify the Contractor's participation in those projects, or
 - c. A letter from the pile manufacturer, pile distributor or manufacturer's representative expressing ability and intent to provide on-site supervision of the pile installation.
 - 3. A listing of all safety violations lodged against the Contractor within the previous three years and the current status or final resolutions thereof. Descriptions of safety improvements instituted within the previous three years may also be submitted, at the Contractor's discretion.
 - 4. Evidence of pile designer's competence. Evidence of competence in the design of helical pile shall be provided to the Owner's satisfaction and may include any or all of the following:
 - a. Recommendation from the pile manufacturer, pile distributor or manufacturer's representative
 - b. Registration as a Professional Engineer or recognition by the local jurisdictional authority
 - c. A list of at least three projects completed within the previous three years wherein the pile designer designed helical piles similar to those shown in the project plans,

such list to include names and phone numbers of those project owner's representatives who can verify the engineer's participation in those projects.

5. Evidence of pile manufacturer's competence and capability. Evidence of competence in the manufacture of helical piles shall be provided to the Owner's satisfaction and may include any or all of the following:
 - a. At least three years of production experience making helical piles.
 - b. The manufacturer's helical piles have been used successfully in at least three engineered construction projects within the last three years, or
 - c. Product listing by an applicable building code authority (ICC, BOCA, ICBO, SBCCI, NES, IBC, etc), or
 - d. Product acceptance by the local building code official(s) having jurisdiction over the project.
- C. Within 2 weeks of receiving the contract award, the Contractor and/or pile designer shall submit the following helical pile design documentation:
1. A pile hardware schedule showing, for each category of pile:
 - a. Product designations for helix and extension sections and all ancillary products to be supplied at each helical pile location.
 - b. Individual pile nominal loads.
 - c. Individual pile loading requirements (if any).
 - d. Manufacturer's published mechanical strengths for the pile assemblies, including load transfer devices.
 2. If pile placements are not shown on the project plans, drawings showing the proposed pile placements and placement tolerances. Known Rights of Way and obstructions (provided by the Owner) shall be shown to demonstrate how the piles will be installed to miss these items.
 3. Proposed production quality control plan, including method and equipment to be used to measure torsional resistance during installation.
 4. Procedures and acceptance criteria for any proposed performance and/or proof testing.
 5. Certification by the pile designer that the selected piles can be installed with ordinary skill to achieve the requirements of the project plans and this specification.
 6. Certification by a registered professional engineer that the proposed loading and test equipment (if any) can be safely used to apply and hold the proposed loads.
 7. Copies of certified calibration reports for torque measuring equipment and load measuring equipment to be used on the project. The calibrations shall have been performed within one year of the proposed starting date for helical pile installation or as recommended by the equipment manufacturer based on the proposed starting date.

Part 2 Products

2.01 Central Steel Shaft

- A. Hot rolled Round-Cornered-Square (RCS) solid steel bars meeting dimensional and workmanship requirements of ASTM A29. The bar shall be modified medium carbon steel grade (similar to AISI 1044) with improved strength due to fine grain size.
 1. Minimum yield strength = 70 ksi.

2.02 Helix Bearing Plate

- A. Per ASTM A656 or A1018 with minimum yield strength of 80 ksi. Plate thickness is 3/8" or 1/2".

2.03 Bolts

- A. The size and type of bolts used to connect the central steel shaft sections together shall conform to SAE J429 Grade 8.

2.04 Couplings

- A. The coupling shall be formed as an integral part of the plain and helical extension material as hot upset forged sockets.

2.05 Plates, Shapes, or Pile Caps

- A. Structural steel plates and shapes conforming to ASTM A36 or ASTM A572 Grade 50.

2.06 Corrosion Protection

- A. Material shall be hot-dipped galvanized in accordance with ASTM A153 after fabrication.

Part 3 Execution

3.01 Installation

- A. Contractor shall furnish and install all helical piles per the project plans and approved pile design documentation. In the event of conflict between the project plans and the approved pile design documentation, the Contractor shall not begin construction on any affected items until such conflict has been resolved.
- B. Contractor shall furnish and install all helical piles per the project plans and approved pile design documentation. In the event of conflict between the project plans and the approved pile design documentation, the Contractor shall not begin construction on any affected items until such conflict has been resolved.
- C. The Contractor shall conduct his construction operations in a manner to insure the safety of persons and property in the vicinity of the work. The Contractor's personnel shall comply with safety procedures in accordance with OSHA standards and any established project safety plan.
- D. The Contractor shall request marking of underground utilities by an underground utility location service as required by law, and shall avoid contact with all marked underground facilities.
- E. The portion of the construction site occupied by the Contractor, his equipment and his material stockpiles shall be kept reasonably clean and orderly.
- F. Installation of helical piles may be observed by representatives of the Owner for quality assurance purposes. The Contractor shall give the Engineer at least 24 hours prior notice of pile installation operations. All helical pile sections and ancillary products shall be marked as necessary to allow correlation with the pile design documentation before shipment from the manufacturer.
- G. Installation equipment shall be rotary type, hydraulic power driven torque motor with clockwise and counter-clockwise rotation capabilities. The torque motor shall be capable of continuous adjustment to revolutions per minute (RPM's) during installation. Percussion

drilling equipment shall not be permitted. The torque motor shall have torque capacity 15% greater than the torsional strength rating of the central steel shaft to be installed. Equipment shall be capable of applying adequate down pressure (crowd) and torque simultaneously to suit project soil conditions and load requirements. The equipment shall be capable of continuous position adjustment to maintain proper Helical Pile alignment.

- H. Provide necessary installation tooling as manufactured by helical pile manufacturer and used in accordance with the manufacturers written installation instructions.
- I. The helical pile installation technique shall be such that it is consistent with the geotechnical, logistical, environmental, and load carrying conditions of the project. The lead section shall be positioned at the location as shown on the pile design drawings. Inclined helical piles can be positioned perpendicular to the ground to assist in initial advancement into the soil before the required batter angle shall be established. After initial penetration, the required inclination angle shall be established. The helical pile sections shall be engaged and advanced into the soil in a smooth, continuous manner at a rate of rotation of 5 to 25 RPM's. Sufficient down pressure (crowd) shall be applied to uniformly advance the helical pile sections a distance approximately equal to the pitch of the helix plate (typically 3 inches) per revolution. The rate of rotation and magnitude of down pressure shall be adjusted for different soil conditions and depths. Extension sections shall be provided to obtain the required minimum overall length and minimum effective torsional resistance as shown on the project plans.
- J. A torque indicator shall be used during Helical Pile installation. The torque indicator can be an integral part of the installation equipment or externally mounted in-line with the installation tooling. The torque indicator:
 - 1. Shall be capable of providing continuous measurement of applied torque throughout the installation.
 - 2. Shall be capable of torque measurements in increments of at least 500 ft-lb
 - 3. Shall be calibrated prior to pre-production testing or start of work. Torque indicators which are an integral part of the installation equipment, shall be calibrated on-site. Torque indicators which are mounted in-line with the installation tooling, shall be calibrated either on-site or at an appropriately equipped test facility. Indicators that measure torque as a function of hydraulic pressure shall be calibrated at normal operating temperatures.
 - 4. Shall be re-calibrated, if in the opinion of the Engineer or Contractor reasonable doubt exists as to the accuracy of the torque measurements.
- K. The Helical Pile installation technique shall be such that it is consistent with the geotechnical, logistical, environmental, and load carrying conditions of the project.

3.02 Termination Criteria

- A. The minimum overall length criteria and the minimum effective torsional resistance criteria as specified in the Design Documentation Submittals must be satisfied prior to terminating the pile installation. In the event any helical pile fails to meet these production quality control criteria, the following pre-qualified remedies are authorized:
 - 1. If the installation fails to meet the minimum effective torsional resistance criterion at the minimum embedment length:
 - a. Continue the installation to greater depths until the torsional resistance criterion is met, provided that, if a maximum length constraint is applicable, continued installation does not exceed said maximum length constraint, Or

- b. Demonstrate acceptable pile performance through proof testing. Or,
 - c. Replace the pile with one having a different helix configuration. The replacement pile must not exceed any applicable maximum embedment length and either
 - (1) be embedded to a length that places its last helix at least three times its own diameter beyond the position of the first helix of the replaced pile and meet the minimum effective torsional resistance criterion, or
 - (2) pass proof testing.
2. If the torsional resistance during installation reaches the helical pile's allowable torque rating prior to satisfaction of the minimum embedment length criterion:
- a. Terminate the installation at the depth obtained if allowed by the Engineer. Or,
 - b. Replace the pile with one having a shaft with a higher torsional strength rating. This replacement pile must be installed to satisfy the minimum embedment length criterion. It must also be embedded to a length that places its last helix at least three times its own diameter beyond the position of the first helix of the replaced pile without exceeding any applicable maximum embedment length requirements and it must meet the minimum effective torsional resistance criterion. Or,
 - c. Replace the pile with one having a different helix configuration. This replacement pile must be installed to satisfy the minimum embedment length criterion. It must also be embedded to a length that places its last helix at least three times its own diameter beyond the position of the first helix of the replaced pile without exceeding any applicable maximum embedment length requirements, and it must meet the minimum effective torsional resistance criterion.
 - d. If allowed by the pile location tolerance or approved by the Engineer, remove and reinstall the pile at a position at least three times the diameter of the largest helix away from the initial location. Original embedment length and torsional resistance criteria must be met. This pile repositioning may require the installation of additional helical piles with nominal loads adjusted for these spacing changes.
3. If the installation reaches a specified maximum embedment length without achieving the minimum effective torsional resistance criterion:
- a. If allowed by the pile location tolerance or approved by the Engineer, remove and reinstall the pile at a position at least three times the diameter of the largest helix away from the initial location. Original embedment length and torsional resistance criteria must be met. This pile repositioning may require the installation of additional helical piles with nominal loads adjusted for these spacing changes. Or,
 - b. Demonstrate acceptable pile performance through proof testing, Or
 - c. De-rate the load capacity of the helical pile and install additional piles as necessary. The de-rated capacity and additional pile location shall be subject to the approval of the Engineer. Or,
 - d. Replace the pile with one having a different helix configuration. This replacement pile must be installed to satisfy the minimum embedment length criterion and it must meet the minimum effective torsional resistance criterion.
4. If a helical pile fails to meet acceptance criteria in a performance or proof test:

- a. Install the pile to a greater depth & installation torque and re-test provided that, if a maximum embedment length constraint is applicable, continued installation will not exceed said maximum length constraint, Or
- b. Replace the pile with one having more and/or larger helix plates. It must be embedded to a length that places its last helix at least three times its own diameter beyond the position of the first helix of the replaced pile without exceeding any applicable maximum embedment length requirements. This replacement pile must be re-tested. Or, If approved by the Engineer, de-rate the load capacity of the helical pile and install additional piles. Additional piles must be installed at positions that are at least three times the diameter of the largest helix away from any other pile locations and are approved by the Engineer. Piles installed in cohesive soils shall not be spaced closer than four helix diameters.
- c. Proof testing to qualify a pile under any of the foregoing remedial actions shall not be used to satisfy proof testing frequency requirements shown in the project plans or the design documentation.
- d. If a helical pile fails a production quality control criterion for any other reason, any proposed remedy must be approved by the Engineer prior to initiating its implementation at the project site.

3.03 Installation Records

- A. The Contractor shall provide the Owner, or his authorized representative, copies of individual helical pile installation records within 24 hours after each installation is completed. Formal copies shall be submitted at the completion of the structure. These installation records shall include, but are not limited to, the following information:
 1. Date and time of installation
 2. Location of helical pile
 3. Pile Reveal
 4. Actual helical pile type and configuration
 5. Total length of installed pile
 6. Actual inclination of pile
 7. Actual effective torsional resistance
 8. Calculated geotechnical capacity based on actual torsional resistance and soil parameters appropriate for subsurface conditions within 3 helix diameters above below the helix depth.
 9. Comments pertaining to interruptions, obstructions, or other relevant information.

3.04 Pile Testing

- A. If pile testing is required, the Contractor shall furnish all labor, equipment and pre-production helical piles necessary to accomplish the testing as shown in the approved pile design documentation. Contractor shall apply the specified loads for the specified durations and record the specified data, for the specified number of piles. No deviations from the test plan(s) will be allowed without explicit approval in writing from the Engineer. Pile testing shall be in accordance with ASTM D1143. Contractor shall provide the Engineer copies of raw field test data or reports within 24 hours after completion of each load test. Formal test reports shall be submitted within 30 days following test completion. Formal test reports shall include, but are not limited to, the following information:

1. Name of project and Contractor
2. Name of Contractor's supervisor during installation
3. Name of third party test agency, if any
4. Pre-production or production test
5. Date, time, and duration of test
6. Unique identifier and location of helical pile tested
7. Type of test (performance or proof)
8. Description of calibrated testing equipment and test set-up
9. Actual helical pile type and configuration
10. Steps and duration of each load increment
11. Cumulative pile-head movement at each load step
12. Signatures as required by local jurisdiction

3.05 Cleanup

- A. Within one week of completion of the work, the Contractor shall remove any and all material, equipment, tools, building materials, concrete forms, debris, or other items belonging to the Contractor or used under the Contractor's direction.

End of Section

Specifications

Division 32 Exterior Improvements

Section 32 0190 Maintenance of Planted Areas

Part 1 General

1.01 Summary

- A. The work specified in this Section consists of the maintenance and establishment of the planted areas in accordance with these specifications. This is to include all the constructed wetland and upland planted areas as shown to be planted in accordance with the landscape planting Plans.
- B. The maintenance period for this project shall be one year from date of Substantial Completion.

1.02 Related Work Specified Elsewhere

- A. Section 32 9220: Native Seeding
- B. Section 32 9000: Plantings

1.03 Quality Assurance

- A. Application of herbicides shall be done by a Michigan Department of Agriculture & Rural Development licensed pesticide applicator. For wetland applications, the applicator must be licensed in Category 5 (aquatic); other application can be done with a Category 2 (forestry) or Category 6 (right-of-way) license. Submit evidence of licensing for each applicator.
- B. An MDEQ Aquatic Nuisance Control Permit may be required for applications near or adjacent to water. The Contractor shall be responsible for obtaining any necessary permit.
- C. The Contractor is required to complete, as a minimum, one (1) maintenance event per month during the growing season, which is April 25 – October 26.
 - 1. The Contractor shall notify the Owner at least 24-hours in advance that the Contractor will be onsite to perform maintenance activities.
 - 2. A written summary of the maintenance activities will be submitted to the Engineer with each invoice, including photographic documentation of the work performed.
 - 3. Invoices will be processed for the year at the end of the growing season.

Part 2 Products (Not Used)

Part 3 Execution

3.01 Work to be Performed

- A. The Contractor shall ensure that the survival level of planted vegetation is maintained at 90% or greater during the maintenance period.
 - 1. Replanting of all herbaceous and woody plants, trees or shrubs shall conform to the requirements of the planting specifications.

2. A summary of replants installed shall be submitted to the Engineer in the monthly maintenance report. The monthly maintenance report will be filed during the growing season of the maintenance and establishment period.
- B. The Contractor shall effectively remove the undesirable species within the area to be maintained. At any time during the maintenance and establishment period, the Contractor shall ensure that the presence of the undesirable species in area coverage is contained at the 10% or less level. Undesirable species include the following invasive plants:
1. Black Locust/*Robinia psuedoacacia*
 2. Tree-of-Heaven/*Ailanthus altissima*
 3. Multiflora Rose/*Rosa multiflora*
 4. Honeysuckle/*Lonicera japonica*
 5. Japanese Knotweed/*Polygonum cuspidatum*
 6. Giant Reed/*Phragmites australis*
 7. Buckthorn/*Rhamnus cathartica-frangula*
 8. Autumn Olive/*Elaeagnus umbellata*
- C. Undesirable plant removal will be completed by hand whenever practical, or as specified in specific specification sections and permits. The Contractor shall remove and properly dispose of all undesirable plant material at the Contractor's expense. No additional compensation shall be made for this item during the maintenance period.
- D. If herbicides will be required within 50-feet of the Flint River or constructed wetland areas, only herbicides labeled for application in aquatic sites shall be applied.
1. Proper selective herbiciding procedures shall be performed by a trained and registered aquatic applicator, licensed in accordance with the applicable commercial laws/regulations of the State of Michigan.
 2. Herbicide shall not be applied during dormancy of the target plant.
- E. No sooner than two (2) weeks from the date of application the herbicide the Contractor shall completely remove the dead vegetation of the undesirable species and properly dispose of the dead vegetation off-site.
- F. The Contractor shall furnish and apply all other material, including water and accessory items as may be required to facilitate the continued establishment and success of grass, plants, trees, and shrubs specified to be maintained.
- G. The Contractor shall prune plants, trees and shrubs specified to be maintained, including removing and properly disposing of the pruned plan material at the Contractor's expense.
- H. Once the seeded area(s) are well established, and at the direction of the Engineer or the Owner, the Contractor shall furnish and supply labor and equipment necessary to mow the seeded area(s) a minimum of one (1) time per season.

3.02 Conditions and Requirements

- A. Supplemental watering of the planted area(s) may be required depending upon weather conditions antecedent to, during, and after plant installation or seeding. The Contractor shall plan for a minimum of four (4) supplemental watering events during the growing season.

1. No additional compensation shall be provided to the Contractor for watering during the maintenance and establishment period unless the Contractor is specifically requested by the Engineer to provide additional watering.
 2. Supplemental watering shall be done with a slow-release hose or other device to allow the water to soak the soil at the root zone of the plant material and not runoff and cause erosion.
- B. The Contractor shall be responsible for ensuring that, for the maintenance period, the presence of undesirable vegetation is maintained at or below 10% coverage of the landscaped area.
- C. The Contractor shall seed the planted areas as indicated on the planting plan. Successful seeding shall be defined at two points: (1) initially within 14-days of seeding a healthy stand of cover crop has germinated, and (2) growing to provide cover over a minimum of 80% of the area seeded. Seeding success during the maintenance and establishment period will also be conditioned on permanent seed species germinated and growing at the end of the first-year growing season so that a uniform matrix of permanent plant material is established with minimal (i.e., less than 15%) non-established areas in the planting area. If at the end of either period, the Contractor has failed to establish a uniform stand of the desired species, the Contractor shall re-seed and mulch the area at the direction of the Engineer at no additional cost to the Owner.
- D. Plant material - including grass, plants, trees, and shrubs - shall be warranted for one (1) year during the maintenance and establishment period. All warranted plant material shall be in satisfactory health at the end of the maintenance period as determined by acceptance of the project by the Engineer and final payment of the Maintenance and Establishment Period invoice. If 25% or more of the warranted plant material is dead or considered dead in the opinion of the Engineer prior to the end of the maintenance period, the Contractor shall replace the dead material at no charge. Replanting shall be done with live plant material during the appropriate season.
1. A tree shall be considered dead when the main leader has died back, or if 25% or more of the crown is dead.
 2. Predation from animals shall not relieve the Contractor from replacing the plant material. The Contractor shall replant and provide protection to the plant material.

End of Section

Section 32 1123 Aggregate Base Courses

Part 1 General

1.01 Scope

This Section includes aggregate base courses complete with aggregate materials constructed in preparation for paving or aggregate surfacing.

1.02 Related Work Specified Elsewhere

1. Unit Prices: Section 01 2200
2. Site Construction Performance Requirements: Section 01 8900
3. Subgrade Preparation: Section 31 2313
4. Bituminous Paving: Section 32 1216
5. Concrete Paving: Section 32 1313

1.03 Reference Standards

Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications:

ASTM- ASTM International

AASHTO- American Association of State Highways and Transportation Officials

MDOT- Michigan Department of Transportation, Standard Specifications for Construction, latest edition

1.04 Allowable Tolerances

The finished surface shall be shaped to conform to plan grade and cross section within a tolerance of 3/4 inch in ten (10) feet (30 mm per 5 m).

1.05 Test Reports

The testing lab shall provide the ENGINEER with two (2) certified copies of the test results of the thickness of the compacted aggregate. The core drilling, testing for thickness and the certification

of the test results shall be performed by a testing laboratory approved by the ENGINEER.

1.06 Stockpiling Aggregate

Aggregate shall be deposited in stockpiles in such a manner that the material may be removed from the stockpile by methods which will provide aggregate having a uniform gradation.

Stockpiling of aggregate, in excess of four (4) feet (1.2 m) in depth, on the completed subbase or aggregate surface will not be permitted, except with the approval of the ENGINEER.

1.07 Environmental Requirements

Comply with the requirements for aggregate base or surfacing installations due to outside ambient air temperatures specified under Article 3.08 of this Section.

Part 2 Products

2.01 Dense-Graded Aggregate

The dense-graded aggregate gradation shall conform to Series 21, and 22, as specified in MDOT, Section 902.05.

2.02 Calcium Chloride Additives

The calcium chloride additives shall conform to ASTM D98 and as specified in MDOT, Section 903.02.

2.03 Water

Water used for compaction and dust control shall be reasonably clean and free from substances injurious to the finished product. Water from sources approved by the Michigan State Department of Public Health as potable may be used.

Part 3 Execution

3.01 Excavation Verification

Prior to the placing of any aggregate material, examine the excavation for the grades, lines, and levels required to receive the new Work. Ascertain that all excavation and compacted subgrades or subbases are adequate to receive the new Work. Correct all defects and deficiencies before proceeding with the Work.

3.02 Subgrade Conditions

Prior to the placing of any aggregate material, examine the subgrade or subbase to ascertain that it is adequate to receive the aggregate to be placed.

If the subgrade or subbase remains wet after all surface water has been removed, the ENGINEER may require the installation of edge drain.

3.03 Existing Improvements

Investigate and verify locations of existing improvements, including structures, to which the new Work will be in contact. Necessary adjustments in line and grade, to align the new Work with the existing improvements must be approved by the ENGINEER, prior to any changes.

3.04 Preparation of Subgrade or Subbase

The subgrade or subbase shall be fine graded to the cross section indicated on the Plans, and shall be thoroughly compacted prior to the placing of the aggregate material.

3.05 Installation - General

The width, thickness, and type of aggregate materials shall be indicated on the Plans or as directed by the ENGINEER.

No aggregate material shall be placed until the subgrade, or subbase, or existing aggregate surface has been approved by the ENGINEER.

3.06 Installation of Aggregate Base Course

The aggregate base course shall be placed by a mechanical spreader or other approved means, in uniform layers to such a depth that when compacted, the course will have the thickness shown on the Plans.

The depth of any one layer, when compacted, shall not be more than eight (8) inches (200 mm). If the required compaction cannot be obtained for the full depth of the aggregate course spread, the thickness of each course shall be reduced or, with the approval of the ENGINEER, adequate equipment shall be used to compact the aggregate to the required unit weight.

The subgrade or subbase shall be shaped to the specified crown and grade and maintained in a smooth condition. If hauling equipment causes ruts or holes in the subgrade or subbase, the hauling equipment will not be permitted on the subgrade or subbase, but shall be operated on the aggregate base course behind the spreader.

The aggregate shall be compacted to at least 95% of maximum unit weight by the use of approved pneumatic-tired compaction equipment or vibratory compactors.

The optimum moisture content shall be maintained until the prescribed unit weight is obtained and each layer shall be compacted until the maximum unit weight is attained before placing the succeeding layer.

When approved by the ENGINEER, additional water may be applied by an approved means, to the aggregate to aid in the compaction and shaping of the material.

Motor graders, trimmers or other approved equipment shall be used to shape the aggregate base course and maintain it until the surface course is placed.

When hauling material over the base course, subbase or subgrade, the CONTRACTOR shall limit the weight and speed of his equipment to avoid damage to the subgrade, subbase or aggregate base course. If the subgrade, subbase or aggregate base course becomes rutted due to the CONTRACTOR's operation, the subgrade, subbase or base course shall be removed and replaced, acceptable to the ENGINEER, at the CONTRACTOR's expense.

With the approval of the ENGINEER, chloride additives may be used by the CONTRACTOR to facilitate his compaction and maintenance of the aggregate surface. The amount and method of

combining the chloride additives are at the option of the CONTRACTOR and are at his expense.

3.07 Maintenance During Construction

The aggregate base course and aggregate surface shall be continuously maintained in a smooth and firm condition during all phases of the construction operation.

The CONTRACTOR, at his expense, shall provide additional materials needed to fill depressions or bind the aggregate.

3.08 Temperature Limitations

Aggregate materials shall not be placed when there are indications that the mixtures may become frozen before the maximum unit weight is obtained.

In no case shall the aggregate be placed on a frozen subgrade or base course unless otherwise directed by the ENGINEER.

3.09 Testing

During the course of the Work, the ENGINEER may require testing for compaction or density and for thickness of material. The testing and coring required shall be performed by a testing laboratory acceptable to the OWNER and approved by the ENGINEER. The cost for testing and coring shall be at the expense of the OWNER.

When thickness tests are done, a minimum of one depth (thickness) measurement will be made every 400 linear feet (120 m) per traffic lane. The lane width shall be as indicated on the Plans or as determined by the ENGINEER. If two (2) lanes are constructed simultaneously, only one test is necessary to represent both lanes. For areas such as intersections, entrances, cross-overs, ramps, widening strips, acceleration and deceleration lane, at least one depth measurement will be taken for each 1,200 square yards (1000 m²) of such areas or fraction thereof. The location of the depth measurement will be at the discretion of the ENGINEER.

The maximum unit weight shall be understood to mean the maximum unit weight per cubic foot (or cubic meter) as determined by ASTM D1557, Method D.

3.10 Defective Work

A. Thickness

Measurements of aggregate base course thickness will be made to the nearest 1/4 inch (5 mm). Depths may be 1/2 inch (10 mm) less than the thickness indicated on the Plans provided that the average of all measurements taken at regular intervals shall be equal to or greater than the specified thickness. In determining the average in place thickness, measurements which are more than 1/2 inch (10 mm) in excess of the thickness indicated on the Plans will be considered as the specified thickness plus 1/2 inch (10 mm).

Locations of the depth measurements will be as specified herein unless otherwise directed by the ENGINEER. Sections found to be deficient in depth shall be corrected by the CONTRACTOR using methods approved by the ENGINEER.

B. Weight

When the aggregate material is measured by weight in Tons (or metric tons), the pay weights for aggregates will be the scale weight of the material, including admixtures, unless the moisture content is more than six (6) percent. Moisture tests will be made at the start of weighing operations and at any time thereafter when construction operations, weather conditions or any other cause may result in a change in the moisture content of the material. If the tests indicate a moisture content in excess of six (6) percent, the excess over six (6) percent will be deducted from the scale weight of the aggregate until such time as moisture tests indicate that the moisture content of the material is not more than six (6) percent.

End of Section

SECTION 32 13 13 CONCRETE PAVING

GENERAL

1.01 SCOPE

- A. This Section includes both plain and reinforced portland cement concrete paving complete with concrete material admixtures, joints, forms, equipment requirements, field quality control and appurtenances required to complete the portland cement concrete paving Work indicated on the Plans.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01 22 00 - Unit Prices
- B. Section 01 5000: Temporary Facilities and Controls
- C. Section 31 2313: Subgrade Preparation
- D. Section 31 2319: Dewatering
- E. Section 32 1123: Aggregate Base Courses
- F. Section 32 1723: Pavement Markings
- G. Section 32 9219: Seeding
- H. Section 32 9223: Sodding

1.03 REFERENCE STANDARDS

- A. Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications.
 - 1. AASHTO M 33M: Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
 - 2. AASHTO M 324: Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
 - 3. AASHTO T 26: Standard Method of Test for Quality of Water to Be Used in Concrete
 - 4. ASTM A615/A615M: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 - 5. ASTM A706/A706M: Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
 - 6. ASTM A996/A996M: Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
 - 7. ASTM A1064/A1064M: Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
 - 8. ASTM C33/C33M: Standard Specification for Concrete Aggregates
 - 9. ASTM C94/C94M: Standard Specification for Ready-Mixed Concrete
 - 10. ASTM C143/C143M: Standard Test Method for Slump of Hydraulic-Cement Concrete
 - 11. ASTM C150/C150M: Standard Specification for Portland Cement
 - 12. ASTM C172/C172M: Standard Practice for Sampling Freshly Mixed Concrete

13. ASTM C260/C260M: Standard Specification for Air-Entraining Admixtures for Concrete
14. ASTM C309: Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
15. ASTM C494/C494M: Standard Specification for Chemical Admixtures for Concrete
16. ASTM C618: Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
17. ASTM C989/C989M: Standard Specification for Slag Cement for Use in Concrete and Mortars
18. ASTM D98: Standard Specification for Calcium Chloride
19. ASTM D994/D994M: Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
20. ASTM D1751: Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
21. ASTM D5893/D5893M: Standard Specification for Cold Applied Single Component Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements
22. ASTM D6690: Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
23. American Concrete Paving Association
24. MDOT: Michigan Department of Transportation, Standard Specifications for Construction, latest edition.

1.04 MATERIAL REPORTS

- A. At the request of the ENGINEER, the CONTRACTOR shall provide the ENGINEER with certification that the various materials to be used conform to the Standards referred to in the Specifications.
- B. The CONTRACTOR shall submit a list of his source of material supply to the ENGINEER for review prior to placing any order.
- C. The CONTRACTOR shall provide the ENGINEER, prior to the actual delivery of the ready-mixed concrete, the mix design as required by ASTM C94/C94M .

1.05 THICKNESS AND COMPRESSIVE STRENGTH REPORTS

- A. The testing lab shall provide the ENGINEER with two (2) certified copies of the test results of the thickness and compressive strength of the concrete. The core drilling, testing for thickness and compressive strength, and the certification of the test results shall be performed by a testing laboratory approved by the ENGINEER.

1.06 WATER QUALITY TEST REPORTS

- A. The testing lab shall provide the ENGINEER with two (2) certified copies of the test results of the quality of water to be used in the concrete. The sampling and testing of water quality shall be in accordance with AASHTO T 26 requirements, and the certification of the tests' results shall be performed by a testing laboratory approved by the ENGINEER.

1.07 REQUEST FOR MATERIAL VARIANCE

- A. All requests for variances in the materials, as specified, shall be made in writing to the ENGINEER.
- B. Two (2) copies of the request shall be submitted for the ENGINEER's review and approval.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Comply with the requirements for concrete installation due to outside ambient air temperatures specified under Part 3 of this Section.
- B. Comply with the requirements for protecting new Work against damage from rain, as specified under Part 3 of this Section.
- C. Comply with the requirements for protecting new Work against damage from cold weather, as specified under Part 3 of this Section.

PRODUCTS

2.01 CEMENT

- A. Cement shall be low alkali, air-entraining Portland cement conforming to ASTM C150/C150M, Type IA or Type IIIA.

2.02 FINE AGGREGATES

- A. The fine aggregate gradation shall conform to ASTM C33/C33M and to fine aggregate, 2NS, as specified in MDOT, Section 902.08.

2.03 COARSE AGGREGATE

- A. The coarse aggregate gradation shall conform to ASTM C33/C33M and to coarse aggregate, 6A, or 6AA as specified in MDOT, Section 902.03.

2.04 WATER

- A. Water to be used for mixing and curing concrete shall be reasonably clean and free from oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.
- B. Waters from sources approved by the Michigan Department of Public Health as potable may be used without testing.
- C. Water requiring testing shall be tested in accordance with the current Method of Test for Quality of Water to be used in Concrete, AASHTO T-26, and specified in MDOT, Section 911.

2.05 CONCRETE ADMIXTURES

- A. Air-Entraining Admixtures
 - 1. Air-entraining admixtures for concrete shall conform to ASTM C260/C260M and as specified in MDOT, Section 903.01.
- B. Concrete Accelerators
 - 1. Chemical admixtures, other than calcium chloride, for accelerating the set of Portland cement concrete shall conform to ASTM C494/C494M, Type C or Type E.
 - 2. Calcium chloride in flake or pellet form shall conform to ASTM D98, Type S, Grade 1 or grade 2, flake or pellet form, and as specified in MDOT, Section 903.04.
 - 3. Calcium chloride in solution form shall conform to MDOT, Section 903.04.
- C. Water-Reducing and Water-Reducing Retarding Admixtures

1. Water-reducing admixtures and water-reducing retarding admixtures shall conform to ASTM C494/C494M, Type A or Type D, except that neither type of admixture shall contain calcium chloride, and as specified in MDOT, Section 903.02.

D. Pozzolanic Admixtures

1. Fly Ash shall conform to ASTM C618, Type F, and as specified in MDOT, Section 901.07.
2. Ground granulated blast furnace slag shall conform to ASTM C989/C989M, Grade 100, minimum

2.06 CONCRETE CURING COMPOUNDS

- A. White membrane curing compound for curing concrete shall conform to ASTM C309, Type 2, Class B Vehicle, and as specified in MDOT, Section 903.06.
- B. Transparent membrane curing compound for curing base course concrete shall conform to ASTM C309, Type 1-D, Class B Vehicle, and as specified in MDOT, Section 903.06.

2.07 LANE TIE BARS

- A. Bar reinforcement for pavement tie bars shall conform to ASTM A706/A706M, or ASTM A615/A615M, Grade 60, and as specified in MDOT, Section 914.09.

2.08 STEEL WELDED WIRE FABRIC

- A. Welded steel wire fabric for concrete mesh reinforcement shall conform to ASTM A1064/A1064M, and as specified in MDOT Section 905.06, and shall be fabricated as shown on the Plans.

2.09 DOWEL BARS

- A. Dowel Bars and basket assemblies for Transverse expansion and contraction joints shall be ASTM A615/A615M Grade 40 and conform to MDOT Section 914.07.

2.10 STEEL HOOK BOLTS

- A. Hook bolts shall conform to ASTM A706/A706M, or Grade 60 of ASTM A615/A615M, or ASTM A996/A996M. Hook bolts shall be 5/8 inch diameter. Along the edge of existing concrete, expansion anchored hook bolts shall be used.

2.11 JOINT FILLERS

- A. Fiber joint filler material for expansion joints shall conform to ASTM D1751, and as specified in MDOT, Section 914.03.
- B. Bituminous premolded joint filler material shall conform to ASTM D994/D994M and also AASHTO M 33M.
- C. Polyethylene premolded joint filler for pressure relief joints shall be a flexible, low-density, expanded, extruded polyethylene plank. The polyethylene plank shall be formed by the expansion of polyethylene base resin in an extrusion process and shall be homogeneous, closed-cell and multi-cellular.

2.12 JOINT SEALANTS

- A. Hot-poured type joint sealant shall conform to AASHTO M324 or ASTM D6690 Type II and as specified in MDOT, Section 914.04.
- B. Cold-applied, single component type, joint sealant shall conform to ASTM D5893.

2.13 CONCRETE MIX

- A. Concrete shall yield a minimum compressive strength of 3500 PSI when cured in a moist room at a temperature within a range of 65 to 75 degrees F for a period of 28 days.
- B. Mixes shall be a nominal 564 lbs/cyd mix except that a minimum of 25% Type F Fly Ash shall be used in the mix. The CONTRACTOR shall provide documentation from actual mixes used on projects showing 28 day compressive strength of not less than 3500 PSI when tested under field conditions.
 - 1. Water reducers, additional fly ash, ground granulated blast furnace slag (GGBFS), and other pozzolans, may be used when approved by the ENGINEER. The fly ash quantity may not exceed 40%; GGBFS quantity shall be not less than 25% not more than 40%.
 - 2. Maximum total replacement of cement shall not exceed 40%. GGBFS and Fly Ash must replace cement on a pound for pound basis.
- C. Cement shall be air-entraining Portland cement ASTM C150/C150M, Type IA. If high-early strength concrete is desired, Type IIIA is required.
- D. High early strength concrete shall be 4500 PSI, 658 lbs/cyd with a water reducer. Water cement ratio shall be between 0.38 and 0.39.
- E. The air content of the concrete shall be dependent on the maximum size aggregate as follows:

Maximum Size of Aggregate	Air by Volume (%)
1-1/2 to 2-1/2 inch	5
3/4 to 1 inch	6
3/8 to 1/2 inch	7-1/2

- F. The slump of the concrete shall be between 1-1/2 to 2-1/2 inch where machine methods are used for striking off and consolidating the concrete. If the ENGINEER permits hand finishing, the slump may be increased to 3-1/2 inch.
- G. Ready-mixed concrete shall be in accordance with ASTM C94/C94M, Alternate 2, and shall yield a minimum compressive strength of 3500 PSI when cured in a moist room at a temperature within a range of 65 to 75 degrees F for a period of 28 days.
- H. The ENGINEER shall be provided with the mix design for review and approval, prior to the actual delivery of the concrete.

EXECUTION

3.01 VERIFICATION OF EXCAVATION AND FORMING

- A. Prior to the installation of any concrete, examine the excavation and forms for the grades, lines, and levels required to receive the new Work. Ascertain that all excavation and compacted subgrades are adequate to receive the concrete to be installed.
- B. Correct all defects and deficiencies before proceeding with the Work.

3.02 VERIFICATION OF SUBGRADE CONDITIONS

- A. Prior to the installing of any concrete, examine the subgrade to ascertain that it is adequate to receive the concrete to be installed. If the subgrade remains wet after all surface water has been removed the ENGINEER may require the installation of edge drain.

3.03 EXISTING IMPROVEMENTS

- A. Investigate and verify location of existing improvements, including structures, to which the new Work is to be connected. Make necessary adjustments in line and grade to align the new Work with the existing improvements after approval by the ENGINEER.

3.04 BATCH PLANT

- A. An adequate site for the batch plant shall be obtained by the CONTRACTOR, at his expense. The site shall be maintained, and the plant operated in accordance with the conditions and requirements established by the community in which the plant is located.

3.05 FINE GRADING

- A. The subgrade shall be fine graded to the cross section shown on the Plans and shall be thoroughly compacted prior to the placing of forms or concrete.

3.06 INSTALLATION - GENERAL

- A. The width, thickness, and type of concrete pavement shall be specified on the Plans or as approved by the ENGINEER.
- B. At street intersections, curb drops, conforming to the current rules and regulations of Act 8, Michigan PA 1973, shall be provided for the construction of sidewalk ramps.
- C. Curb drops for sidewalk ramps and driveway approaches shall be provided as specified in locations called for on the Plans or as approved by the ENGINEER.
- D. Construction operations shall be restricted to the existing right-of-way. If additional area is required, the CONTRACTOR shall furnish the ENGINEER with written permission from the property owner for any part of the operation he conducts outside the established right-of-way.
- E. The CONTRACTOR shall maintain traffic access at all intersections. Vehicle access shall also be maintained to all commercial and public properties and elsewhere as designated by the ENGINEER.

3.07 FORMS

- A. Except when paving with a slip-form paver, forms shall be used and shall be made of metal, having an approved section, which shall insure their rigidity under impact, thrust and weight of the heaviest machine carried on them. The thickness of the metal shall be not less than 1/4 inch, except that a minimum thickness of 3/16 inch will be permitted if the form is a trapezoidal cross section.
- B. Forms shall have a minimum length of ten 10 feet and a depth not less than the edge thickness of the Work prescribed, except the subgrade may be a maximum of 1 inch lower than the bottom of the forms when approved by the ENGINEER. The width of the base in direct bearing on the soil shall be not less than 0.75 of the form depth except that a width of less than 8 inches will not be permitted.
- C. Each 10 feet section of form shall have at least three (3) stake pockets. The forms shall be straight, free from distortion, and shall show no vertical variation greater than 1/8 inch in 10 feet lengths from the true plane surface on the top of the form when tested with a 10 feet straightedge; and shall show no lateral variation greater than 1/4 inch from the true plane surface on the vertical face of the form when tested with a straightedge.
- D. Approved wood or flexible forms and hand finishing will be required on all pavement where the radius for the edge of the pavement is less than 200 feet.

- E. The method of connection between form sections shall be such that a locked joint is formed free from vertical movement in excess of 1/8 inch and from horizontal movement in excess of 1/4 inch under the impact, thrust and weight of the heaviest machine carried on the forms.
- F. Sufficient forms shall be provided so that it will not be necessary to remove them in less than 12 hours, or longer if required, after the concrete has been placed.

3.08 EQUIPMENT REQUIREMENTS

- A. Approved, mechanical concrete placing and finishing equipment shall be used for concrete paving except for gapped areas or where otherwise approved by the ENGINEER.
- B. The CONTRACTOR shall furnish sufficient equipment for the placing of concrete pavement. The equipment shall be on the job site and ready for normal operation before the paving operation is started. All equipment shall be in good working order. The equipment shall be subject to inspections and testing during construction.
- C. The equipment shall be of sufficient capacity that the paver can operate continuously and obtain a rate of production that insures good workmanship and eliminates overloading of equipment or frequent interruptions or delays.
- D. Equipment operating on or near the pavement shall be equipped with rubber-tired wheels.
- E. Subgrade Roller or Compactor
 - 1. This equipment shall be self-propelled steel-wheeled or a pneumatic-tired roller weighing not less than 8 tons or a self-propelled vibratory compactor of adequate size to compact the subgrade to the required density.
- F. Subgrade Planer
 - 1. A steel-shod subgrade planer supported by two (2) flanged wheels resting on the side forms may be used for trimming the subgrade in small areas when approved by the ENGINEER.
 - 2. The steel-shod template shall be adjustable to fit the shape of the bottom of the pavement and shall have adequate connection to a rigid frame to maintain the crown.
 - 3. The planer shall be of sufficient weight to plane off all high spots encountered.
- G. Base Trimmer
 - 1. For slip-form construction, a powered, self-propelled base trimmer will be required. This base trimmer shall be capable of trimming the base to the required cross section.
- H. Water Supply Equipment
 - 1. The pumps and pipe lines shall be such capacity and nature as to insure an ample supply and adequate pressure of water, simultaneously, for all the requirements of machinery, mixing, sprinkling subgrade, and all other requirements of the Work.
 - 2. Water may be supplied in tank wagons to augment inadequate pipe lines or to replace them entirely if a sufficient number of units are employed.
- I. Finishing Machine
 - 1. The finishing machine shall be power driven and of an approved type which will strike off and compact the concrete with a screeding and troweling action. The machine shall be capable of finishing the concrete in the manner specified herein, and shall provide a minimum of two (2) oscillating screeds.

2. A combination concrete spreader/finishing machine (i.e.: Pav-Saver®) may be used for residential streets not exceeding 100 feet in length and 18 feet in width or when approved by the ENGINEER.
 - a. The combination type machine must have suitable automatic vibrators, strike-off bars, augers, screeds, finishing pan, etc., in accordance with the requirements of this section, to produce a densely compacted, homogeneous concrete slab, true to line, grade and cross section.

J. Concrete Spreader

1. An approved concrete spreader with a strike-off board or a separate strike-off shall be used to level each layer of concrete, before placing of reinforcement, and before finishing the concrete.
 - a. It shall have sufficient weight and rigidity to retain its shape under working conditions to properly strike off the concrete.
 - b. Two separate spreaders are not required where an approved mesh depresser type machine is used.
2. A concrete spreader is not required for the construction of residential street concrete pavement when approved by the ENGINEER.

K. Vibratory Screed

1. An approved hand-propelled vibratory screed shall be provided for use in gapped areas at driveways and intersections, and where machine methods are not feasible to screed and consolidate the concrete.
 - a. Gaps finished by this method shall be limited to one (1) joint spacing in length and one (1) single lane width.
2. The screed shall consist of a steel-shod strike board having a minimum thickness of two 2 inches and equipped with a gasoline engine capable of producing at least 5,000 vibrations per minute.
3. Other vibratory screeds may be approved by the ENGINEER.

L. Membrane Sprayer

1. A mechanically-pumped pressure sprayer capable of applying a continuous uniform film of curing compound will be required.
2. The equipment shall provide adequate stirring of the compound during application.

M. Slip-Form Paving Equipment

1. When pavement is placed by the slip-form method, the slip-form paving equipment shall spread, consolidate, screed, and mechanically float the freshly-placed concrete in such a manner that only a minimum of hand finishing will be necessary to provide a dense and homogeneous pavement.
2. The machine shall be equipped to vibrate the concrete for the full width and depth of the pavement being placed.

N. Floats

1. The mechanical float shall be a combination float finisher. Where a mechanical float is an integral part of a slip-form paver, a separate mechanical float will not be required.

2. A float finisher shall consist of a machine having two (2) screeds and be equipped with a suspended pan float. The second screed and the pan float shall be suspended in such a manner that they operate independently of the side forms.
 3. A mechanical float will not be required for the construction of residential street concrete pavement.
- O. Footbridge
1. A movable bridge shall be provided when necessary to satisfactorily finish the pavement or construct joints. The bridge shall be designed and constructed so that it will not come in contact with the concrete.
- P. Transverse Float
1. This float shall be made of metal and shall be at least 10 feet in length and of the box or channel type with a floating face at least 6 inches in width. It shall be constructed so as to be light in weight, rigid and free from warps.
- Q. Vibrator
1. The vibrator for consolidating the concrete along the faces of the forms and adjacent to joints shall be an approved electric or mechanical vibrator of an internal type, not less than 2 inches in diameter. It shall have minimum frequency of 5,000 vibrations per minute for a tube 2 inches in diameter, 3,600 vibrations per minute for a tube 4 inches in diameter, or a proportionate frequency for an intermediate size.
 2. At least two (2) vibrators shall be provided for each concrete paving unit on the project.
 3. The vibrators used adjacent to the forms in conventional paving shall be connected with the equipment on which they are mounted such that vibration of the concrete will start automatically with the forward movement of the equipment and stop automatically whenever forward movement stops.
- R. Form Tamper
1. A mechanical form tamper of approved design will be required on all projects. It shall be capable of thoroughly and uniformly compacting the soil under the forms.
- S. Strike-Off for Reinforcement
1. An approved strike-off shall be used to level the concrete before placing the pavement reinforcement. It shall be adjustable and shall be supported by two (2) flanged wheels on each end which rest on the side forms.
 2. It shall have sufficient weight and rigidity to retain its shape under working conditions and properly strike off the concrete.
 3. An approved hand strike-off resting on the forms shall be used for irregular areas.
 4. The strike-off may be a part of the concrete spreader or a finishing machine.
- T. Lane Tie Bar Installer
1. When not placed on approved chairs, lane tie bars shall be installed by use of an approved mechanical device.
- U. Reinforcement Carrier
1. Reinforcement not placed on chairs shall be transferred from the hauling equipment to a movable bridge which spans the pavement being cast or placed by other approved means which will not result in contamination of the concrete.

2. The bridge shall be capable of carrying the reinforcement load without appreciably deflecting the forms.

V. Joint Filling and Sealing Equipment

1. The equipment for filling and sealing joints shall be available for inspection and testing at least 48 hours prior to its use.
2. The sealing machine shall include a mechanical mixer capable of mixing the sealing components into a uniform, homogeneous mass.
3. The heating kettle for hot poured sealing material shall be of the indirect-heating or double boiler type, using oil as the heat transfer medium.
 - a. It shall have a thermostatically controlled heat source, a built-in automatic agitator, and thermometers installed to indicate both the temperature of the melted sealing material and that of the oil bath.
 - b. The CONTRACTOR shall demonstrate that the equipment proposed for use will consistently produce a joint sealer of proper pouring consistency.
4. The hot-poured sealing material shall be applied directly from the heating kettle; the kettle shall be equipped with a pressure pump, hose and nozzle suitable for forcing the sealing material to the bottom of the joint and completely filling the joint.
 - a. The rate of application shall be controlled so as to completely fill the joint and not spill the material on the surface of the pavement.
 - b. The hose and nozzle shall maintain the temperature of the sealing materials so that the loss in temperature is not more than 10 degrees F between the nozzle and the heating tank.
 - c. Heat from a direct flame on the nozzle shall not be used to maintain the proper temperature of the sealing material.
 - d. The heating equipment shall be mounted on rubber-tired wheels, and only rubber-tired equipment shall be used to move the heating equipment on the pavement.
5. Cold applied sealing compound shall be applied by means of pressure equipment that will force the material to the bottom of the joint and completely fill the joint without overflowing onto the surface of the pavement.

W. Preformed Neoprene Joint Sealing Equipment

1. Equipment for applying the lubricant and installing the preformed joint seal may be either power or hand operated equipment suitable for installing the joint seal as recommended by the manufacturer.

X. Sandblasting Equipment or Power Wire Brush

1. Sandblasting equipment shall be of proper size and capacity to obtain the cleaning specified and shall operate at a nozzle pressure adequate for the performance of the Work.
2. Nozzles shall be of proper diameter in relation to the width of joint and shall be replaced as necessary due to enlargement by wear.
3. A power wire brush may be used in place of sandblasting equipment.

Y. Air Compressors

1. Air compressors shall be portable and capable of furnishing sufficient air to maintain a nozzle pressure adequate to remove all loose fragments of concrete and foreign material from the joints.
 2. Suitable traps shall be employed to maintain the compressed air free of oil and moisture.
- Z. Power Broom
1. A mechanical broom with pickup suitable for cleaning the pavement will be required.
- AA. Concrete Saw
1. Two (2) self-propelled concrete saws which are adequately powered to cut hardened concrete to a minimum depth as shown on the Plans will be required. The minimum thickness of the saw blade shall be 3/16 inch.
 2. Saws shall be equipped with suitable guards.
- BB. Miscellaneous Equipment
1. All other small tools to completely and satisfactorily finish the Work, including straightedges for testing pavement and forms, shall be provided by the CONTRACTOR.

3.09 PLACEMENT OF FORMS

- A. Forms shall be placed and checked for line and grade at least 500 feet in advance of placing concrete.
- B. Forms shall be adequately staked and braced to resist the pressure of concrete and the thrust of the equipment.
- C. Forms shall have uniform bearing on the subgrade throughout their entire length and width.
- D. After setting the forms to grade, thoroughly tamp both the inside and outside with an approved mechanical form tamper.
- E. Forms shall be thoroughly cleaned before they are placed.
- F. Forms shall be neatly and tightly joined, and shall be securely staked by at least three (3) stakes per form.
- G. Forms shall be oiled before concrete is placed against them.
- H. Forms shall be checked for line and grade, after being set.
- I. Forms showing a variance from the staked line by more than 1/4 inch or from the staked grade by more than 1/8 inch in 10 feet shall be adjusted.
- J. Where the use of flexible forms are required, sufficient back bracing shall be provided to prevent undue deflection of the forms during placement of the concrete.

3.10 PLACING CONCRETE

- A. Placing of concrete should not commence or continue until the condition of the subgrade has been approved by the ENGINEER.
- B. The concrete shall be spread or distributed as soon as placed. If a mechanical spreader is not used, the concrete shall be deposited in a manner that requires a minimum of re-handling to avoid segregation and separation of materials. The concrete shall be deposited to a height sufficiently above grade so that when consolidated and finished it shall conform to the required finished grades.

- C. Concrete along the faces of forms and adjacent to joints shall be consolidated and compacted to fill all voids.
- D. Forms shall not be vibrated to consolidate the concrete.
- E. When the pavement is placed in two (2) layers, the first layer may be cast 3 to 6 inches narrower on each side than the proposed pavement slab, so that the full depth of pavement, at the edges, will be cast with the second layer.
- F. The equipment shall vibrate concrete placed full depth for the complete width and depth of the pavement being placed. For concrete placed in two (2) layers, only the second layer will be required to be vibrated.
- G. The placing of concrete shall be continuous as much as possible between transverse joints.
- H. Whenever a temporary halt in operation occurs, the concrete and unfinished end of the slab shall be covered with wet burlap or plastic.
- I. If the interruption of Work continues for more than 20 minutes, a construction joint shall be placed, provided the proposed construction joint is 15 feet or more from the last joint for reinforced pavement and at least 10 feet or more from the last joint in plain concrete pavement.
 - 1. Sections of pavement shorter in lengths will not be permitted and, if constructed, shall be removed and replaced at the CONTRACTOR's expense.
- J. Integral curbs, where specified or required, shall be constructed monolithic with the pavement slab. The curb material shall be placed before the pavement has started its initial set and shall be of the same mix as the concrete pavement.
- K. Base and back forms will be required when constructing straight curbs, and back forms with templates of the required curb shape shall be used when constructing rolled and mountable curbs. The curb concrete shall be spaded sufficiently to eliminate all voids and tamped to bring the mortar to the surface, after which the curb shall be given a final finish to match the texture of the pavement.
- L. After removing forms, any visible areas of honeycomb or minor defects shall be immediately filled with mortar, having one part of Portland cement and two parts fine aggregate, and shall be applied with a wooden float.
- M. Where adjacent pavement lanes are constructed in separate pours, no equipment shall be operated upon recently placed concrete until the pavement has attained at least 85% of the design strength as determined by testing cores taken from the project, or until the pavement is 14 days old, at the option of the ENGINEER.
- N. Any equipment wheels operating on the pavement, shall operate at least 1 foot from the edge of the pavement. The equipment wheels shall be rubber-tired.
- O. The paver shall not be permitted on the new slab until the pavement has attained full design strength. The paver shall not operate on any new slab without using wood mats having an approved thickness and width to insure that the pavement will not be marked or structurally damaged.
- P. Pavers are not permitted to operate on residential streets.
- Q. If the curing compound is damaged, it shall be repaired by spraying additional curing compound on the damaged areas as soon as the Work is completed.
- R. The filler strip on pavement widening projects shall be poured as soon as possible but not later than the first working day following the placing of the slab.

- S. At all intersections and where access is required to property along the Project, construction shall be completed by gapping the proposed pavement. Load transfer, contraction, or end-of-pour joint devices shall be placed at the gapped ends of the pavement.
- T. In lieu of pavement gapping, the CONTRACTOR may elect to place a temporary bridge, of a design approved by the ENGINEER, to provide access. Furnishing, placing, maintaining, and removing the bridge shall be at the CONTRACTOR's expense.

3.11 PLACING PAVEMENT REINFORCING

- A. Where reinforcement is required, the sheets or mats shall be placed at the depth below the surface of the finished pavement, as shown on the Plans.
- B. Pavement reinforcement shall be shipped and delivered to the Work in flat sheets or mats.
- C. Adjacent sheets or mats shall be lapped, as indicated on the Plans, and shall be fastened to each other in no less than two (2) places in each pavement lane.
- D. Where the width of pavement varies, the reinforcement requirements shall be the same as called for on the Plans. Split sheets or mats may be used to conform to the particular pavement configuration. Side laps shall not be less than the spacing of the longitudinal wires or bars.
- E. On widening Projects where the pavement slab is less than 6 feet in width, 1/2 inch diameter longitudinal reinforcing bars may be substituted for standard reinforcement, providing the bars are spaced not more than 12 inches center-to-center. The first bar shall be not more than 3 inches from the edges of the widened slab, and the bars shall be lapped a minimum of 12 inches.
- F. Reinforcement shall be installed by one of the following methods:
 - 1. Chairs upon which reinforcement is to be mounted shall support the reinforcement and shall have such bearing on the base that there will be no undue penetration of the base. The maximum spacing of the chairs shall be sufficient to maintain the reinforcement at the specified depth. The reinforcement shall be placed directly from the hauling unit unto the chairs.
 - 2. When reinforcement is placed between two (2) layers of concrete, the first layer shall be mechanically spread and struck off to the required depth below the proposed finished surface. The reinforcement shall be placed directly from the carrier onto the struck off concrete.
 - 3. Any area where the use of the mechanical spreader or mechanical strike-off is not feasible, the reinforcement shall be mounted on chairs.

3.12 JOINTS

- A. All longitudinal and transverse joints shall conform to the details and shall be constructed at the locations shown on the Plans or as directed by the ENGINEER.
- B. All joints shall be constructed true to line with their faces perpendicular to the surface of the pavement.
- C. Transverse joints shall be constructed at right angles to the centerline of the pavement, unless otherwise called for on the Plans or as determined by the ENGINEER. The joints shall not vary more than 1/4 inch from a true line.
- D. The surface of the pavement adjacent to all joints shall be finished to a true surface. Where indicated on the Plans, joints shall be edged to the radius shown or a minimum 1/4 inch radius. The surface across the joints shall be tested with a 10 foot straightedge as the

joints are finished and any irregularities shall be corrected before the concrete has hardened.

- E. When pavement is laid in partial width slabs, transverse joints in the succeeding slabs shall be placed in line with the like joints of the first slab. In the case of widening existing pavements, transverse joints shall be placed as shown on the Plans, or as directed by the ENGINEER.
- F. Keyways, where required, shall be accurately formed with templates of metal, wood, or paper securely pinned in place. The gauge or thickness of the material in the templates shall be such that the full keyway, as specified, is formed in the correct location.
- G. Longitudinal Joints
 - 1. Longitudinal joints shall be a longitudinal lane tie joint with tie bars or a bulkhead construction joints with hook bolts. Where called for on the Plans a keyway shall be constructed in the bulkhead construction joint.
 - a. Longitudinal Lane Tie Joint (D)
 - 1) Longitudinal lane tie joints with tie bars shall be planes of weakness formed by sawing a groove in the hardened concrete according to the alignment, width and depth shown on the Plans.
 - 2) Tie bars of the type, diameter and length called for on the Plans, shall be placed at the required depth parallel to the finished surface, at right angles to the joint and at the uniform spacing also called for on the Plans or as approved by the ENGINEER.
 - 3) Bar chairs shall be used to support the lane tie bars or the lane tie bars may be installed by use of a mechanical device, approved by the ENGINEER. The placing of lane tie bars in the concrete by hand methods will not be permitted.
 - 4) The joint shall be sawed as soon as the concrete will not spall or not more than three (3) days after placement, and shall be completed before traffic of any kind uses the pavement. Immediately following the sawing of the joint, the slurry resulting from the sawing operation shall be completely removed from the joint, and the immediate area by flushing with a jet of water under pressure.
 - 5) The joint shall be blown out with a jet of compressed air to remove the flushing water.
 - (a) After the joint is dry it shall be cleaned out with a jet of compressed air with a working pressure of at least 90 psi and then shall be sealed in accordance with these specifications with an application of an approved hot or cold applied type joint sealing compound.
 - (b) The sealing compound shall be applied with approved pressure type equipment with the nozzle extending into the groove and the groove shall be filled until the sealer overlaps the pavement about 1/8 inch.
 - b. Longitudinal Bulkhead Construction Joint (D)
 - 1) Longitudinal bulkhead construction joints with hook bolts shall be used in part-width construction of concrete pavement and elsewhere as shown on the Plans, or as approved by the ENGINEER. The size, spacing, and depth of the hook bolts below the surface of the pavement shall be as shown on the Plans.

- 2) For slip-form paving, lane ties of an approved type may be substituted for hook bolts and shall be spaced at 30 inch centers, unless otherwise indicated on the Plans.
 - (a) Lane ties for slip-form paving shall be placed in the concrete with a pneumatic powered installer or equipment producing equal results.
 - (b) Lane ties, which are not set with adequate consolidation of the concrete or are not within 30 degrees of being perpendicular to the pavement edge in a horizontal plane, shall be replaced with drilled-in expansion-anchored lane ties.
- 3) Where a bulkhead joint is to be constructed, hook bolts and couplings shall be attached to the forms and shall be held in position during the placing and finishing of the concrete so as to permit the removal of the pavement forms without damage to the concrete or hook bolt assembly. The ends of the couplings shall be protected so that the concrete, dirt or other materials cannot enter the couplings and prevent a satisfactory connection with either hook bolt.
- 4) Where hook bolts or lane ties are installed for use in future pavement widening, in curb, or curb and gutter construction, a rust preventive oil shall be inserted into the open end of the couplings immediately after removal of the pavement forms by means of a hand operated pump in sufficient quantity to completely cover the internal threads.
 - (a) After application of the protective oil a neoprene or plastic plugs shall be inserted into the ends of the couplings to completely seal the opening without protruding outside of the couplings more than 3/8 inch.
- 5) The concrete shall be edged with a tool having the radius of curvature and depth of lip shown on the Plans. The second pour of concrete shall be edged with a longer lipped edging tool than that used on the first concrete pour.
- 6) After the concrete has cured for the required time, all extraneous material shall be removed from the joint and the joint then sealed with an approved hot-poured or cold-applied elastic-type compound. The use of sandblasters and a jet of compressed air will be required to clean the joint before sealing.

H. Transverse Joints

1. Transverse joints shall be contraction joints, plane of weakness joints, dummy joints, expansion joints, construction joints, end-of-pour joints and pressure relief joints.
 - a. Contraction Joints (C)
 - 1) Contraction joints shall consist of a load transfer unit and a joint groove formed by sawing. Contraction joints shall be constructed as indicated on the Plans and shall be spaced a maximum of every 57' - 3" or as provided for elsewhere.
 - 2) The load transfer unit shall be epoxy coated dowel bars, spaced and arranged in the positions indicated on the Plans, accurately held in place by an approved metal device so as to be perpendicular to the plane of the cross section of the pavement and parallel to the centerline at a depth from the surface equal to 1/2 the thickness of the slab.
 - 3) This device shall consist of connected transverse and longitudinal members arranged to hold each dowel so firmly that its final position after concreting

operations shall not vary more than 1/8 inch per foot of length from its designated line and grade. The device shall permit the joint to be completely assembled alongside the Work, and it shall be sufficiently rigid so that the joint can be lifted into place on the subgrade as a unit.

- 4) One end of each dowel bar shall be free to move in the slab as the concrete contracts and expands.
 - (a) To accomplish this, 2/3 the length of each dowel shall be thoroughly lubricated with liquid asphalt. The liquid asphalt coating shall be applied to a sawed end of the dowel bar or, in the case of dowel bars with sheared ends, a metal cap shall be placed on the coated end of the dowel bar.
 - (b) The asphalt coating shall be sufficiently dry before using the dowels so that it will not be removed by handling and placing the dowels in the joint.
 - (c) The bars shall be installed so that the alternate bar on each side of the joint shall be the coated end of the bar.
- b. Plane of Weakness Joints (WT)
 - 1) Plane of Weakness joints shall be placed in plain concrete pavements only and is to be constructed immediately after the finishing operation has been completed. A groove shall be formed in the plastic concrete with a metal forming bar to the depth indicated on the Plans.
 - 2) A premolded bituminous filler strip shall be placed in the groove formed by the metal bar, from a bridge operating on the pavement forms.
 - 3) The concrete shall then be floated against the sides of the filler, and the joint edged to a 1/8 inch radius.
- c. Plane of Weakness Joint for Concrete Base Course (WTB)
 - 1) Dummy joints shall be placed in reinforced concrete pavements only where called for on the Plans.
 - 2) They shall be constructed immediately after the finishing operation has been completed by forming a groove in the plastic concrete with a metal forming strip into which expanded polystyrene or other approved temporary filler is placed.
 - 3) The material shall be installed flush with the surface of the pavement and the area on both sides of the joint shall be finished. Transverse joints with a temporary filler shall not be edged.
 - 4) The pavement reinforcement shall be continuous through this joint.
- d. Expansion Joints (E) and (E1)
 - 1) Expansion joints (E1) shall consist of a load transfer unit and a premolded fiber filler and shall be used on reinforced concrete pavements or where shown on the plans.
 - 2) Expansion joints (E) shall consist of a premolded fiber filler without the load transfer unit and shall be used for joints in concrete capping, end connections with structures or existing pavements, plain concrete pavements, and other places where shown on the Plans or where installation of the load transfer unit is not feasible; as approved by the ENGINEER.

- 3) The load transfer units shall be assembled and the epoxy coated bars lubricated with liquid asphalt. The liquid-asphalt-coated end of each bar shall be provided with a close fitting metal cap.
 - 4) The fiber filler shall extend the full depth and width of the joint.
 - (a) After installation, the top shall be not less than 1/2 inch and no more than 1 inch below the finished surface.
 - (b) It shall be furnished in lengths not less than the lane widths being poured. Where additional partial lengths are necessary, the minimum length of load transfer unit and premolded fiber filler shall be sufficient to span two (2) dowel bar spacings.
 - (c) Where more than one (1) section is allowed and used in a joint, the sections shall be securely joined together.
 - 5) For expansion joints in curb lanes with integral curb or separate curb and gutter, the fiber filler used in the pavement shall extend completely through the curb section. The fiber filler placed in the curb above the slab shall be 1 inch in width.
 - 6) During installation, the joint shall be held in place by an approved installing device which shall be securely staked.
 - (a) The top edge of the filler shall be protected, while the concrete is being placed, by a metal channel cap of at least 10-gage material having flanges not less than 1-1/2 inches in depth.
 - (b) The channel cap shall be shaped to the proposed crown of the pavement and shall extend over the full length of the filler.
- e. Pressure Relief Joints (PR)
- 1) The method of constructing a pressure relief joint shall be as indicated on the Plans.
 - 2) The pressure relief joint material shall be a flexible, low-density, expanded, extruded polyethylene plank. This joint material shall be cut off to 1/2 inch below the top of the pavement surface and shall extend entirely through and to within 1/2 inch of the face and top of the curb.
- f. End of Pour Joints and Construction Joints
- 1) End of pour joints in reinforced pavement shall be formed by placing a bulkhead and installing a load transfer device, as specified for contraction joints, except that the ends of the dowel bars shall not be lubricated. The load transfer device shall be so installed that each dowel bar will be embedded in the concrete for 1/2 of its length.
 - 2) When the next pour is made, a space for hot-poured rubber joint filler shall be provided by placing a temporary filler in the fresh concrete.
 - 3) End-of-pour joints shall be constructed using 2-piece dowels and a bulkhead, and shall be placed where it is anticipated that three (3) days or more will elapse between the casting of adjacent pours.
 - 4) Construction joints and end-of-pour joints shall be sealed as specified for transverse contraction joints.

- 5) End of pour joints in plain concrete pavements shall be formed by placing a bulkhead, fiber keyway, and installing 1/2 inch diameter deformed bars, 30 inches in length, at 18 inch intervals across the end of the pavement.
 - 6) The pavement across the end of both slabs shall be thickened and the joint shall be edged and sealed.
2. All transverse joints in a concrete pavement shall extend entirely through the integral curb or separate curb and gutter. The material used to construct the joint in the curb shall be of the same kind as provided for the pavement.
 3. Bituminous fiber filler shall be used to construct the expansion joints in the integral curb of reinforced concrete pavements.
 - a. The thickness of the fiber filler material in the curb above the gutter shall be 1 inch.
 - b. The joint material shall be precut so as to conform to the geometric shape and cross-sectional area of the curb, and shall be placed in intimate contact with the filler material in the pavement.
 - I. The edges of all transverse joints in the integral curb shall be rounded with an approved finishing tool, having a radius of 1/4 inch.

3.13 CONSOLIDATING AND FINISHING

- A. The sequence of operations after the placing of concrete shall be:
 1. striking off and consolidating,
 2. floating,
 3. edging,
 4. and final finishing with burlap drag.
- B. Mechanical methods shall be employed to strike off and consolidate or compact the concrete, except in gapped areas or where the pavement width will not permit the use of machine methods. Gaps less than one (1) joint opening in length may be finished by hand methods, provided they are finished in single-lane widths.
- C. Strike off, consolidate and compact the concrete to such an elevation that when all finishing operations are completed, the surface will conform to the required finished grade and cross section.
 1. At least 4 inches of concrete above the finished pavement grade shall be maintained ahead of the screed for its entire length.
 2. In consolidating the surface of the pavement, on residential street construction when a single screed finishing machine is used, it shall operate over each section of the pavement twice.
 3. Only sufficient mortar shall be worked to the surface to provide a dense smooth finish.
 4. Excessive operation of the machine over a given area will not be permitted. Segregated particles of coarse aggregate which may collect in front of the screed shall be thoroughly mixed by hand with the mass of concrete already on the subgrade.
- D. If it is not possible to use mechanical equipment on irregular areas, an approved, self-propelled vibratory screed shall be employed to strike off and properly consolidate the concrete surface to the required finish grade.
 1. The entire area of the pavement shall be consolidated to insure an absence of voids.

2. Where it is not possible to use a vibratory screed, a hand strike board of an approved design, will be permitted.
 - a. Strike-off boards shall be moved forward with a combined longitudinal and transverse motion, with neither end raised from the side forms during the process.
 - b. A slight amount of excess concrete shall be kept in front of the front edge at all times.
 - c. When striking off and consolidating by hand, pours will be limited to single lanes or 1/4 of intersections.
- E. After striking off and consolidating, the surface shall be made uniform by longitudinal or transverse floating by a mechanical method unless the pavement is permitted to be constructed in single lane widths.
- F. Where mechanical floating is an integral part of the operation of a slip-form paver, separate mechanical floating methods will not be required.
- G. Mechanical longitudinal floating will not be required for residential street construction.
- H. When mechanical equipment is not used for floating, a transverse float at least 10 feet in length shall be operated across the pavement by starting at the edge and slowly moving to the center and back again to the edge. The float shall then be moved ahead 1/2 of its length and the operation repeated.
- I. Care shall be taken to preserve the crown and cross section of the pavement.
- J. The float finishing operation shall not proceed until the concrete has attained a consistency so that no excess concrete is carried ahead of the float but the entire surface can be floated and sealed.
- K. Immediately following the float finishes and while the concrete is still plastic, the CONTRACTOR shall test the slab surface for trueness by means of a 10 foot straightedge or acceptable float.
 1. The straightedge shall be placed at the center of the slab with the blade parallel to the centerline and pulled slowly and uniformly to the edge. This operation shall be repeated until the surface of the concrete is free from irregularities and makes contact at all points with the bottom of the straightedge. The straightedge shall then be moved forward 1/2 its length and the operations repeated.
 2. Depressions found in the surface shall be filled with fresh concrete and consolidated by floating with a long-handled float not less than 10 foot in length. This float may also be used to smooth sections of the surface that may have become rough or torn by dragging with the straightedge.
- L. For pavement constructed by the slip-form method, the edge settlement shall be determined as soon as practical after paving operations begin. Edge settlement in excess of 3/8 inch shall be corrected before the concrete has hardened.
 1. When edge settlements in excess of 1/4 inch persist, paving shall be suspended and operational corrections made before the ENGINEER will permit the resumption of paving. If the CONTRACTOR consistently fails to construct pavement within these tolerances, the use of slip-form methods shall be discontinued and pavement placed by means of conventional forms.
 2. When paving is accomplished by the slip-form paving method, all mortar paste shall be wiped from the sides of the slab.

3. The surface shall then be tested for smoothness with the straightedge. During this operation, the contact of the straightedge with the concrete shall be uniform over the entire length tested. At the time of testing, the surface shall be free from soft mortar or excessive water. The testing straightedge shall be used for this purpose only.
- M. Where the float finisher method is not utilized, as soon as the hand floating is completed, all laitance, surplus water, and inert material shall be worked entirely off the pavement and the surface made smooth by dragging with a rigid straightedge 10 foot in length and the surface shall be tested.
- N. As soon as all excessive moisture has disappeared and while it is still possible to produce a uniform surface of gritty texture, the pavement shall be finished by dragging a seamless strip of damp burlap or cotton fabric, not less than 5 feet nor more than 6 feet in width, over the full width of the pavement.
 1. The burlap or cotton drag shall be pulled by a bridge supported on a pavement forms. The fabric shall be renewed as often as necessary to obtain the required texture.
- O. Immediately after the initial finishing with burlap, the edges of the slab and all specified joints shall be finished with an edging tool to the radii indicated on the Plans. The pavement shall then be given a final finish by dragging the damp burlap or cotton fabric over that portion of the pavement disturbed by the edging operation.

3.14 SURFACE REQUIREMENTS

- A. All high spots in the surface, exceeding 1/8 inch from the straightedge but not more than 1/2 inch in 10 feet shall be removed or reduced by rubbing with a carborundum brick and water until contact with coarse aggregate is made. If contact with coarse aggregate is made before reaching an acceptable tolerance, such high spots shall be removed by an approved surface-grinding machine before acceptance of the pavement.
- B. High spots in excess of 1/2 inch in 10 feet will be evaluated by the ENGINEER and if the Work is rejected, it shall be removed and replaced at the CONTRACTOR's expense.
- C. The CONTRACTOR shall take immediate steps to eliminate the cause of the defective surface.

3.15 CURING

- A. After the finishing operations have been completed and immediately after the free water has left the surface, the surface of the slab shall be completely coated and sealed with a uniform layer of white membrane curing compound.
- B. The compound shall be applied in a continuous uniform film by means of mechanically pumped pressure sprayer equipment at a rate of 1 gallon per 200 sft of surface. The curing compound shall not be thinned.
- C. The equipment shall provide adequate stirring of the compound during application. The equipment for applying the compound must be on the Project and approved by the ENGINEER before Work is started.
- D. Hand-spray equipment will be permitted only for the application of the curing compound over the sides of the slab, and for any minor damaged areas.
- E. If rain falls on the newly coated pavement before the film has dried sufficiently to resist damage, or if the film is damaged in any other way, the CONTRACTOR will be required to apply a new coat of material to the affected areas.
- F. The treated surface shall be protected by the CONTRACTOR from injury for a period of at least seven (7) days. All traffic, either foot or otherwise, will be considered as injurious to

the film of the applied compound. A minimum of foot traffic will be permitted on the dried film as necessary to properly carry on the Work including the removal of any high spots, provided any damage to the film is immediately repaired by the application of a second coat of the compound.

- G. Immediately after the forms are removed, the entire area of the side of the slab shall be coated with the curing compound at the rate specified for the pavement surfacing.
- H. The CONTRACTOR shall provide on the Project sufficient burlap or polyethylene coverings for the protection of the pavement in case of rain or breakdown of the spray equipment. Failure to provide proper curing will be considered as sufficient cause for immediate suspension of the concreting operations.

3.16 REMOVAL OF FORMS

- A. Forms may be removed from freshly placed concrete after it has set for 12 hours, provided it can be done without damage to the pavement or curb edge. If during form removal the pavement or curb edge is being damaged, the form removal shall cease until the concrete has attained greater strength.
 - 1. The period of time for removing forms may be increased or decreased when approved by the ENGINEER.
- B. Immediately after removal of the forms, the ends of all joints shall be cleaned, and any visible areas of honeycomb or minor defects shall be filled with mortar, composed of 1-part Portland cement and two (2) parts fine aggregate from the same source as used in the pavement, applied with a wooden float.
 - 1. Immediate steps shall be taken by the CONTRACTOR to correct the conditions contributing to these defects.
- C. The sides of the pavement shall be sprayed with curing compound immediately upon removal of the forms, except where honeycombed areas are to be pointed, and then immediately cured.
- D. Forms and pins shall not be placed on new pavement that is being cured with membrane.

3.17 SAWING JOINTS

- A. All contraction joints, longitudinal lane-tie joints with tie bars, and end of pour joints shall be sawed.
- B. Joints shall be sawed before any traffic is permitted on the pavement.
 - 1. The concrete saw will be permitted on the pavement to saw the joints, but the water supply truck will not be permitted on the pavement until the compressive strength is not less than 3,000 psi.
 - 2. When permitted on the pavement, the water supply truck must be kept a minimum of 50 feet behind the sawing operation.
- C. At least two (2) approved concrete saws shall be available for use at all times, and one saw shall be capable of sawing a joint groove 2-1/2 inch deep.
- D. The saw cut for transverse end-of-pour joints shall be made to receive the joint sealing material.
- E. Longitudinal lane-tie joints with the tie bars shall be sawed in accordance with the alignment and dimensions indicated on the Plans.

- F. For joints formed in one operation, the joint groove shall be sawed before any transverse cracks develop. Raveling or spalling along the joint shall be repaired as specified elsewhere in this Section.
- G. Transverse contraction joints shall be sawed in two stages:
 - 1. Stage 1 sawing
 - a. The first stage shall be a relief cut directly over the center of the load transfer assembly. The initial relief cut shall be made as soon as the saw can be placed on the freshly poured concrete, and the sawing shall continue as long as the pavement can support the saw without making or appreciably raveling of the joint.
 - b. When water is not used in the sawing operation, membrane curing compound shall be applied immediately.
 - c. When water is used in the sawing operation, the slurry resulting from the sawing operation shall be completely removed from the cut and from the immediate area by flushing with a jet of water. Additional membrane curing compound shall be applied within 12 hours after the relief cut has been made.
 - 2. Stage 2 Sawing
 - a. Second stage sawing of joints shall not start until the concrete has cured for a minimum of 48 hours. The joint groove shall be centered over the relief cut and sawed to the specified dimensions shown on the Plans plus any increase in width of the relief cut due to shrinkage or contraction. Groove width tolerance shall be $\pm 1/16$ inch.
 - b. Joints sawed without the use of water shall be blown clean of all foreign material by a jet of compressed air.
 - c. If water was used in the sawing operation, the slurry resulting from the sawing operation shall be completely removed from the groove and the immediate area by flushing with a jet of water and then blown dry with compressed air.
- H. All transverse joint grooves shall receive a final cleaning with a jet of compressed air adequate to remove all foreign material, just prior to permanent sealing.
- I. If the specified seal is not installed within seven days of final sawing, the joint groove shall be temporarily sealed with a suitable material or device to prevent the infiltration of foreign material.
- J. Traffic shall not be permitted over the full width joint grooves prior to the installation of either the permanent seal or temporary seal.

3.18 PATCHING JOINTS

- A. General
 - 1. After the joints have been sawed and cleaned, they shall be inspected for spalls and voids.
 - 2. All loose, unsound or damaged concrete shall be removed to the satisfaction of the ENGINEER.
 - 3. Spalls and voids will be classified as minor, intermediate or major spalls and shall be repaired accordingly.
- B. Minor Spalls

1. Any spalls or voids which have increased the specified size of the joint groove beyond any of the following limits, but less than 36 square inches, shall be repaired by patching with an approved epoxy mortar before the seal is installed.
 - a. Spalls which extend more than 1/4 inch from the joint face and over 1/2 inch below the surface of the pavement.
 - b. Spalls which extend more than 1/4 inch from the joint face and 2 inches or more in length, regardless of the depth of spall below the surface of the pavement.
 - c. Void areas larger than 1/2 inch in diameter in the upper 1 inch of the joint face or larger than 1 inch in diameter regardless of location.
2. The spalled concrete surface shall be thoroughly cleaned by sandblasting, power-wire brushing, or hand-wire brushing. The patch area shall then be blown clean with a jet of compressed air.
3. A heavy polyethylene sheet or a rigid material shall be inserted into the joint groove and held tightly against the joint face that is to be patched.
4. The concrete shall be clean and dry when the epoxy resin mortar is placed. The surface shall be made free of frost by heating with a clean source of heat, approved by the ENGINEER, until dry. Care shall be taken not to damage the concrete by heating.
5. The epoxy binder will be a mixture of two (2) parts epoxy resin to one (1) part curing agent by volume, or as approved by the ENGINEER.
6. The epoxy resin compound shall be mixed in a clean metal or polyethylene container with approved stirrer operating at 250 to 500 rpm. While the epoxy resin is being mixed, the curing agent compound shall be gradually added. The mixture shall then be stirred for a minimum of three (3) minutes until it is uniform.
7. After the epoxy binder is thoroughly mixed, a small portion shall be reserved for priming.
 - a. Dry MDOT 2NS sand shall be uniformly blended into the balance of the mixture to give an epoxy mortar of stiff or trowellable consistency. One part of mixed binder to about 3.5 parts of dry sand, by volume, will usually give a workable mix.
8. The spalled surface shall be primed with the freshly mixed epoxy binder scrubbed into the surface with a suitable applicator to insure complete wetting and coverage of all areas to which the epoxy mortar must bond.
9. Immediately after priming, the epoxy mortar shall be placed in the spalled area and finished to the shape of the original pavement surface. If the bond coat is not tacky when the mortar is placed, a second application shall be made. The edge of the patch shall conform with the rest of the joint groove.
10. Dry MDOT 2NS sand shall be sprinkled onto the fresh epoxy mortar surface to eliminate any gloss. After the epoxy mortar has cured sufficiently so that it will not be damaged during sealing operations, the polyethylene insert shall be carefully removed.
11. All joints shall receive a final cleaning with a jet of compressed air to remove all foreign material.
12. When the temperature of the air and the pavement is above 50 degrees F, the hot poured elastic type joint seal may be placed on the day following the placing of the epoxy resin mortar patch. When the temperature of the air and the concrete is below

50 degrees F, the time of curing required for the epoxy mortar shall be as determined by the ENGINEER.

C. Intermediate Spalls

1. Any spalls larger than 36 square inches, but not extending below the reinforcing mat, shall be repaired by sawing and chiseling out the unsound concrete and patching with Portland cement mortar.
2. A saw cut at least 1 inch deep shall be made parallel to the joint groove at the outer extremity of the spalled area. The concrete shall be chipped out to the saw cut so that a vertical face is present at the back of the repair area, and the two ends of the repair area shall be trimmed to approximately vertical faces.
3. The area to be repaired shall be sandblasted to remove all loose particles and then blown clean with a jet of compressed air to remove the sand and all other foreign materials.
4. The repair area shall be flushed with clean water and the excess water shall be blown out with compressed air.
5. A heavy polyethylene sheet or a rigid material shall be inserted into the joint groove and held tightly against the joint face that is to be patched.
6. The bottom and vertical faces of the repair area shall be primed with a grout of creamy consistency made with a 1:1 mixture of Portland cement and MDOT 2NS sand with water.
7. The prime coat will be scrubbed into the surface with a suitable applicator to insure complete wetting and coverage of all areas to which the Portland cement mortar must bond.
8. The cement grout shall be carefully applied to the rough surfaces of the spall area and shall be applied immediately prior to placing of fresh mortar so that the prime coat is wet when covered by mortar.
9. The Portland cement patching material shall be tamped into the repair area and finished level to the pavement surface.
 - a. This Portland cement mortar shall consist of 1-part Portland cement to two (2) parts MDOT 2NS sand with a water content of not more than 4 gallons per sack of cement.
 - b. A liquid air-entraining agent to maintain an air content of 8% to 11% shall be added.
 - c. Calcium chloride in an amount of one (1) percent of the cement content may be added as an accelerator, if approved by the ENGINEER.
10. The edge of the patch at the joint face shall conform with the rest of the joint groove.
11. White membrane curing compound shall be sprayed on the patch surface immediately after the mortar is cast and finished.
12. After 72 hours the polyethylene form shall be carefully removed and all patched joints shall receive a final cleaning with a jet of compressed air to remove all foreign material.

D. Major Spalls

1. When a joint is damaged beneath the depth of the reinforcing mat, it shall be considered a major repair. These major repairs shall be handled on an individual basis under the direction of the ENGINEER.

3.19 SEALING JOINTS

- A. All transverse expansion, contraction, construction, and longitudinal bulkhead construction joints shall be filled and sealed with an approved hot-poured elastic type compound.
- B. Longitudinal lane-tie joints shall be pressure filled and sealed with either an approved hot-poured or cold-applied elastic type compound. These sealing compounds shall not be placed when the atmospheric or pavement temperatures are less than 50 degrees F or when the weather is rainy or foggy.
- C. After the shoulders are completed and the pavement has cured, the joints and pavement surfaces on each side of the joints shall be cleaned of all extraneous matter.
 1. The cleaning shall be done by sandblasting or other methods approved by the ENGINEER that will be equally effective in cleaning the concrete.
 2. The dust and sand present after the sandblasting or cleaning shall be removed by a jet of compressed air. Hand tools shall be used to remove stones and other foreign materials from the joint groove.
- D. Immediately after the joints are cleaned with the compressed air, and with the surface of the concrete in the joint dry, the joint shall be sealed with an approved hot-poured elastic type compound.
- E. The hot-poured compound shall be melted in an approved double boiler type kettle. Direct heating will not be permitted. Also, any sealing material heated in excess of the safe heating temperature shall not be used in the Work.
- F. During the process of pouring the joints, the ENGINEER may, at his discretion, require that sufficient compound be taken from the melting unit to make flow tests.
- G. The ENGINEER may require the CONTRACTOR to modify his method of heating or of charging the heating unit with compound that will produce satisfactory results.
- H. Pouring shall be from the melting kettle equipped with an approved pressure pump hose and nozzle.
- I. When authorized by the ENGINEER, the sealing compound may be poured with a hand-type pouring pot for curbs and short miscellaneous joint lengths, provided a satisfactory joint is obtained.
- J. Pouring of the sealing compound shall be done so as to fill the joint to 1/4 inch below top of pavement. Any sealing compound spilled on the surface of the pavement shall be removed immediately.
- K. After the first pour has cooled to the temperature of the pavement and settled, a second pour shall be made to bring the sealing compound to 1/4 inch of the surface of the pavement.
- L. Traffic shall not be permitted over the poured joint until the compound has hardened sufficiently to resist pickup.
- M. To protect hot-poured and cold-applied sealing compound while it is curing and to prevent pickup by traffic, the sealed joint shall be covered with a strip of paper, 1-1/2 inches wide, or other approved means, immediately following application of the compound. The paper strip shall be left in place until worn off by traffic.

3.20 TRAFFIC CONTROL

- A. Provide all measures necessary to protect and maintain traffic and to protect the Work in accordance with Section 01 5000, Temporary Facilities and Controls, and with the Michigan Manual of Uniform Traffic Control Devices (M.M.U.T.C.D.).

3.21 PROTECTION AGAINST RAIN

- A. The CONTRACTOR shall adequately protect the new concrete from the effects of rain before the concrete has sufficiently hardened.
- B. For this Work, the CONTRACTOR shall have available on the job site at all times enough burlap or 6 mil thick polyethylene film to cover and protect one day's Work.
- C. When rain appears eminent, all operations shall stop and personnel shall begin covering.
- D. As soon as the rain ceases, the concrete shall be uncovered and the surface burlap dragged where necessary.
- E. Curing compound shall be applied to any areas where the compound has been disturbed or washed away. Protection of the new concrete against rain shall be at the CONTRACTOR's expense.

3.22 COLD WEATHER PROTECTION

- A. Any time there is a danger of freezing temperatures, the CONTRACTOR shall have available on-site a sufficient amount of clean, dry straw or hay or polyethylene film or other approved materials to cover at least one (1) day's production. Cold weather protection shall be at the CONTRACTOR's expense. The source of the temperature shall be taken from forecasts prepared by the local weather bureau, recognized as the Official Weather Bureau for the area the new Work is being constructed. The predicted low temperature shall be that forecast to occur during the next 24 hours.
- B. Frozen material shall not be charged into the mixer at any time.
- C. Frost or ice shall be removed from the forms and any steel used in the pavement, prior to placing concrete.
- D. Concrete shall not be placed directly upon a frozen subgrade. The subgrade shall be covered with a layer of straw or hay 12 inches in thickness to protect it against freezing. The straw or hay shall be removed from the finished subgrade immediately ahead of paving operations and piled along the line of construction for use in covering the finished pavement. Prior to the placing of concrete, the subgrade shall be cleaned of loose straw and otherwise prepared in a manner satisfactory to the ENGINEER. Other covering materials as approved by the ENGINEER may be used to prevent subgrade freezing.
- E. To accelerate hardening of the concrete when the temperature of the air in the shade and away from artificial heat is between 40 and 45 degrees F, calcium chloride shall be added to the mix at the rate approved by the ENGINEER. The calcium chloride shall be spread on the materials immediately before discharging into the drum of the mixer. A method approved by the ENGINEER, shall be used for measuring the amount of dry calcium chloride to be added to each batch of concrete. The calcium chloride shall not be placed in contact with the cement.
- F. Immediately after finishing of the concrete and as soon as hardening of the concrete will permit, the pavement shall be covered and the protective covering shall remain in place until the concrete has developed a compressive strength of not less than 3,000 psi for a minimum period of 14 days or as approved by the ENGINEER.

- G. The protective covering shall be placed around and over the forms and it shall extend beyond the edge of the pavement for a distance at least equal to the depth of covering required.
- H. When removing forms, the protective covering should be removed for as short a time as possible and should be replaced promptly to prevent loss of heat.
- I. The mixing and placing of concrete shall stop in sufficient time each day to permit finishing of the concrete and the placing of the required protective covering during daylight hours.
- J. The requirements specified herein for the curing and protection of concrete in cold weather are minimum requirements, and the CONTRACTOR shall be responsible for the quality and strength of the concrete placed. Any concrete injured by frost action shall be removed and replaced at the CONTRACTOR's expense.
- K. Between October 15 and May 15, when the predicted low temperature is to be below 35 degrees F at any time within 72 hours after placing the pavement, the pavement shall be protected and such protective covering shall remain in place until the concrete has developed a compressive strength of not less than 3,000 psi, or for a minimum period of 14 days, unless otherwise authorized by the ENGINEER.
- L. Special Protection
 - 1. No pavement may be placed between October 15 and May 15, unless it is specifically provided for in the Contract Documents, or authorized by the ENGINEER, except that in no case shall concrete be placed when the predicted high temperature is to be below , without written permission of the ENGINEER. When paving is permitted during the period, the following requirements shall apply:
 - a. The temperature of the concrete at the time it is placed on the subgrade shall be not less than 50 degrees F, nor more than 85 degrees F.
 - b. In order to maintain a mix temperature between 50 and 85 degrees F the mixing water or the aggregates, or both, shall be heated as required by the ENGINEER. The water and the aggregates shall be heated to a temperature of not more than 150 degrees F.
 - 1) The heating of aggregates shall be done by the use of steam pipe under the aggregate piles, or by free steam discharged into the aggregate piles, or by steam pipe in the batching bins.
 - 2) The heating of the water and the aggregates shall be controlled so that there will not be any large differences in temperature from batch-to-batch.
 - c. When there is any danger of the predicted low temperature dropping below 35 degrees F all the necessary materials for covering and protecting the concrete, equipment for heating the water and aggregates, when required, and calcium chloride shall be on the Project and available for immediate use for the required method of curing and cold weather protection before any pavement is placed.
 - d. For predicted low temperatures from 35 to 25 degrees F either 1-layer of waterproof paper blankets or 12 inches of loose dry straw or hay shall be placed.
 - e. For predicted low temperatures of 25 to 20 degrees F 1-layer of waterproof paper blankets and 12 inches of loose dry straw or hay shall be placed.
 - f. For predicted low temperatures less than 20 degrees F the minimum requirement for cold weather protection will be 1-layer of waterproof paper blankets and 12 inches of loose dry straw or hay overlaid with a waterproof protective covering

consisting of tarpaulins, paper blankets, polyethylene sheeting or other approved material.

2. When temperature are such that special protection is required as specified above, all concrete placed within the proceeding 72 hours shall be similarly protected.
 3. When special protection is started, it shall be continued until design strength is reached in accordance with the above requirements unless warmer temperatures prevail for a period of at least 48 hours. Permission to eliminate special protection for such a period shall be as approved by the ENGINEER.
- M. Protection of the new concrete against cold weather including ordinary and special protection shall be at the CONTRACTOR's expense.

3.23 CONCRETE TEMPERATURE LIMITATIONS

- A. Concrete shall not be placed when the temperature of the concrete at the point of placement is above 90 degrees F.

3.24 CURB DROP

- A. Curb drops shall be provided for existing and future sidewalk ramps, for approaches for existing driveways and at other locations as determined by the ENGINEER.
- B. Curb drops for sidewalks shall be in accordance with the current rules and regulations of Act 8, Michigan PA 1973, as amended. Curb drops for drive approaches shall be centered with the existing driveway at the property line.
- C. The width of the residential curb drop shall be equal to the width of the driveway determined at the property line plus four feet. Unless otherwise approved by the ENGINEER, the minimum width of the residential curb drop shall be 14 feet.

3.25 SHOULDERS

- A. The shoulders shall be constructed according to the lines, grades, and cross section shown on the Plans and as specified for the particular type of shoulder material required. The shoulders shall be done in such sequence with the surfacing operations that they will be completed not more than seven (7) days after the expiration of the curing period, unless otherwise directed by the ENGINEER.
- B. Aggregate shoulders, when called for, shall be constructed according to the requirements specified under Section 32 1123, Aggregate Base Courses.

3.26 CLEANUP

- A. After the concrete has gained sufficient strength, but no sooner than within 12 hours, the fixed forms shall be removed and the spaces on both sides shall be immediately backfilled with sound earth of topsoil quality.
- B. The backfill shall be compacted, leveled and left in a neat, workmanlike condition.
- C. At a seasonally correct time approved by the ENGINEER, the disturbed area shall be raked, have topsoil placed thereon, and fertilized and seeded per the requirements of Section 32 9219, Seeding, sodded in accordance with Section 32 9223, Sodding, or _____

3.27 OPENING PAVEMENT

- A. The ENGINEER reserves the right to require that curing operations be discontinued when the concrete has reached 85% of the design strength, and to require that the shoulders be completed and the slab be opened to traffic.

3.28 MONUMENT BOXES

- A. All government, plat, and street intersection monuments within existing or proposed pavement shall be preserved by enclosing in standard monument boxes.
- B. Monument box castings shall be furnishing and installed by the CONTRACTOR.
- C. Existing monument boxes shall be adjusted to meet the proposed pavement elevation by removing the castings and resetting to the required elevation.
- D. Support for the monument box shall be concrete bedding, so constructed as to hold them firmly in place.
- E. The adjacent pavement, curb, or curb and gutter shall be replaced to the new elevation, condition and kind of construction, unless otherwise provided.

3.29 TESTING

- A. During the course of the Work, the ENGINEER may require the taking of standard test cores and cylinders, by a testing laboratory acceptable to the OWNER and approved by the ENGINEER.
- B. The making of cylinders, the drilling of cores and testing shall be at the expense of the OWNER.
- C. For each lane of Work:
 - 1. A minimum of one (1) cylinder for testing compressive strength shall be made for each 500 feet, or fraction thereof, or as determined by the ENGINEER.
 - 2. A minimum of two (2) cores for testing compressive strength and for checking thickness shall be drilled each 500 feet, or fraction thereof.
- D. Slump tests for consistency of Portland cement concrete shall be made in accordance with ASTM C143/C143M and ASTM C172/C172M.
- E. In the event the test results on a core indicates a deficiency in either thickness or compressive strength or in the event the test results on a cylinder indicates a deficiency in compressive strength, the following adjustments in the unit price for concrete shall be made based on the average of three (3) cores:

1. Thickness

UNDER REQUIRED THICKNESS	PERCENT OF REDUCTION IN UNIT PRICE
0 to 1/4 inch	None
by more than 1/4 but not exceeding 1/2 inch	20
by more than 1/2 but not exceeding 1 inch	50
by more than 1 inch	Remove & Replace

1. Compressive Strength

UNDER REQUIRED COMPRESSIVE STRENGTH	PERCENT OF REDUCTION IN UNIT PRICE
0 to 150 psi	None

by more than 150 but not exceeding 300 psi	20
by more than 300 but not exceeding 500 psi	50
by more than 500 psi	Remove & Replace

1. Reduction in the unit price are additive, that is if an area is deficient by 3/8 inch and is under strength by 200 psi, the total reduction is 20% plus 20% or a reduction of 40%.
2. The area of a deficient core shall be determined by the drilling and testing of two (2) additional cores, one (1) on each side of the deficient core and 20 feet from it, when possible.
3. The extra core drilling and testing shall be at the CONTRACTOR's expense.

END OF SECTION

Section 32 1315 Sidewalks and Driveways

Part 1 General

1.01 Scope

This Section includes sidewalks, sidewalk ramps, driveways, and drive approaches complete with concrete materials, concrete curing compounds, joint materials, field quality control and appurtenances.

1.02 Related Work Specified Elsewhere

1. Unit Prices: Section 01 2200
2. Clearing and Grubbing: Section 31 1100
3. Subgrade Preparation: Section 31 2313
4. Seeding: Section 32 9219
5. Sodding: Section 32 9223

1.03 Reference Standards

Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications:

ASTM- American Society of Testing and Materials

AASHTO- American Association of State Highway and Transportation Officials

MDOT- Michigan Department of Transportation, Standard Specifications for Construction, latest edition.

1.04 Submittals

Written permission for the use of all local disposal sites shall be obtained and copies shall be furnished to the ENGINEER.

At the request of the ENGINEER, the CONTRACTOR shall provide the ENGINEER with certification that the various materials to

be used conform to the ASTM Standards referred to in the Specification.

1.05 Test Reports

The ENGINEER shall be provided with two (2) certified copies of the test results of the thickness and compressive strength of the concrete. The core drilling, testing for thickness and compressive strength and the certification of the test results shall be performed by a testing laboratory approved by the ENGINEER.

1.05 Environmental Requirements

Comply with the requirements for concrete installation due to outside ambient air temperatures specified under Article 3.11 of this Section.

1.06 Protection

Comply with the requirements for protecting new Work against damage from rain, as specified under Article 3.11 of this Section.

Comply with the requirements for protecting new Work against damage from cold weather, as specified under Article 3.11 of this Section.

Part 2 Products

2.01 Concrete

Concrete shall be in accordance with MDOT Section 601 or 701, use Grade P1 or S2, 3,500 psi (24 MPa) strength; Type IA cement; 6.0 sacks cement per cubic yard (335 kg/m³); 6A coarse aggregate; 2NS fine aggregate; 6.5% ± 1.5% air content; 3-inch (75 mm) maximum slump; no admixtures without the ENGINEER's approval. Type IIIA cement may be used for high-early strength concrete.

2.02 Ready-Mixed Concrete

Ready-mixed concrete shall conform to ASTM C94, Alternate 2.

2.03 Water

Water to be used for mixing and curing concrete shall be reasonably clean and free from oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product. Waters from sources approved by the Michigan State Department of Public Health as potable may be used without test. Water requiring testing shall be tested in accordance with the current Method of Test for Quality of Water to be Used in Concrete, AASHTO T26, and as specified in MDOT, Section 911.

2.04 Concrete Curing Compounds

White membrane curing compound for curing concrete shall conform to ASTM C309, Type 2, Class B Vehicle, and as specified in MDOT, Section 903.06.

2.05 Premolded Joint Filler

Fiber joint filler for expansion joints shall conform to ASTM D1751. Filler shall be of the thickness, as specified herein, or on the Plans, or as approved by the ENGINEER.

2.06 Steel Hook Bolts

Hook bolts shall conform to ASTM A706, or Grade 60 of ASTM A615, A616-96a, or A617-96a. Hook bolts shall be 5/8 inch (16 mm) diameter.

2.07 Joint Sealant

Hot-poured type joint sealant shall conform to ASTM D6690 Type II and as specified in MDOT Section 914.04.

2.08 Concrete Mix

Concrete shall contain a minimum of six sacks, 94 pounds per sack, of cement per cubic yard (335 kg/m³) and shall yield a minimum compressive strength of 3,500 psi (24 MPa) at 28 days.

Cement shall be air-entraining Portland cement ASTM C150, Type 1A. If high-early strength concrete is desired, Type IIIA is required.

High-early concrete can be obtained for small areas by the addition of one sack of cement, Type 1A, per cubic yard of concrete (56 kg/m³).

The air content of the concrete shall be 6.5%± 1.5% by volume.

Maximum slump of the concrete shall be three (3) inches (75 mm).

Ready-mixed concrete in accordance with ASTM C94, Alternate 2, shall be used, unless a written request for other than ready-mixed concrete has been submitted, reviewed and approved by the ENGINEER.

Part 3 Execution

3.01 Verification of Excavation and Forming

Prior to the installation of any concrete, examine the excavation and forms for the proper grades, lines, and levels required to receive the new Work. Ascertain that all excavation and compacted subgrades are adequate to receive the concrete to be installed.

Correct all defects and deficiencies before proceeding with the Work.

3.02 Existing Improvements

Investigate and verify location of existing improvements to which the new Work is to be connected.

Adjustments in line and grade to align the new Work with the existing improvements must be approved by the ENGINEER, prior to any change.

3.03 Forming

The forms shall be of wood or metal, straight and free from warp, clean, and of sufficient strength to resist springing during the process of depositing concrete against them.

The forms shall be the full depth of the concrete.

3.04 Sidewalks, Sidewalk Ramps, Driveways, and Driveway Approaches

Unless otherwise noted in the Contract Documents, all sidewalks and sidewalk ramps shall be four (4) inches (100 mm) thick except at driveways, where the thickness of the sidewalks shall be six (6) inches (150 mm). Sidewalks shall be five (5) feet (1.5 m) wide unless otherwise noted on Plans, and shall slope 1/4 inch per foot (20 mm/m) towards the surface drainage side which in general will be towards the center of the road. Normally sidewalks will be located within the right-of-way, parallel the property lines, at a distance of 1-foot (300 mm) from the property line.

Driveways and approaches shall be six (6) inches (150 mm) thick. The width of driveways and driveway approaches shall be as specified on the Plans or as determined by the ENGINEER.

3.05 Remove Curb for Curb Drop

Construction of sidewalk ramps within street intersections where curbed pavement exists shall conform to the current rules and regulations of Act 8, Michigan PA 1973.

Where there is no proper curb drop for the sidewalk ramp or driveway approach, the CONTRACTOR shall saw cut, to full depth of pavement, and remove a minimum of an 18-inch (450 mm) wide curb and gutter section. When mountable curbs are present, the CONTRACTOR shall remove a 24-inch (600 mm) wide curb and gutter section for the construction of sidewalk ramp, as specified above.

The length of curb and gutter removal shall be determined by the ENGINEER in the field but shall be at least as wide as the proposed sidewalk ramp plus 1-foot (300 mm) on each side.

The removed curb and gutter section shall be replaced with material, equal to what was removed and the joint sealed with hot poured rubber asphalt.

The CONTRACTOR shall install 5/8 inch (15 mm) diameter self-tapping hook bolts, in the existing concrete pavement as indicated on the Plans prior to placing concrete for the removed curb and gutter section.

Curbs may be cut or ground down with an approved concrete grinder when the final results will leave the cut or ground down curb in a smooth, clean condition acceptable to the ENGINEER. Any curbs that are cut or ground down that are not acceptable to the ENGINEER, shall be removed and replaced as specified above at no additional cost.

3.06 Placement of Forms

Wood forms, straight and free from warp, of nominal depth may be used for sidewalk sections less than 25 feet (7.5 m) in length.

Forms shall be staked to line and grade in a manner that will prevent deflection and settlement.

When unit slab areas are to be poured, slab division forms shall be so placed that the slab division joints will be straight and continuous.

Forms shall be set for sidewalk ramps to provide a grade toward the centerline of the right-of-way in accordance with current standards. The grade shall be uniform, except as may be necessary to eliminate short grade changes.

Forms shall be oiled before placing concrete. Forms shall remain in place at least 12 hours after the concrete is placed. There shall be sufficient forms placed ahead of the pouring operations to maintain uninterrupted placement of concrete.

The use of slip form pavers can be allowed when approved by the ENGINEER in lieu of the construction system described above.

3.07 Joints

Transverse and longitudinal expansion and plane-of-weakness joints shall be constructed at the locations specified herein, or as indicated on the Plans or as approved by the ENGINEER.

The transverse expansion joints shall be placed for the full width and depth of the new Work. The transverse expansion joints placed against any existing pavement shall be a minimum of six (6) inches (150 mm) deep but no less than the thickness of the concrete being placed.

Longitudinal expansion joints shall conform to the same requirements as transverse expansion joints.

Joints shall be constructed true to line with their faces perpendicular to the surface of the sidewalk. The top shall be slightly below the finished surface of the sidewalk. Transverse joints shall be constructed at right angles to the centerline of the sidewalk and longitudinal joints shall be constructed parallel to the centerline or as determined by the ENGINEER.

Unless otherwise specified on the Plans or unless otherwise determined by the ENGINEER, when the sidewalk is constructed in partial width slabs, transverse joints in the succeeding slabs shall be placed in line with like joints in the adjacent slab. Also, in the case of widening existing sidewalks, transverse joints shall be placed in line with like joint in the existing sidewalk.

Transverse expansion joints, 1/2 inch (10 mm) thick, shall be placed through the sidewalk at uniform intervals of not more than 50 feet (15 m) and elsewhere as shown on the Plans, or as determined by the ENGINEER.

Expansion joints, 1/2 inch (10 mm) thick, shall also be placed between the sidewalk and back of abutting parallel curb, buildings or other rigid structures, concrete driveways and driveway approaches. The expansion joint between sidewalks and buildings shall be placed 1-foot from the property line and parallel to it.

Expansion joints, 1-inch (25 mm) thick, shall be placed between sidewalk ramps or driveway approaches and the back of curbs.

Plane-of-weakness joints shall be formed every five (5) feet (1.5 m) and shall be produced by use of slab divisions forms extending to the full depth of the concrete or by cutting joints in the concrete, after floating, to a depth equal to 1/4 the thickness of the sidewalk. The cut joints

shall not be less than 1/8 inch (3 mm) nor more than 1/4 inch (5 mm) in width and shall be finished smooth and shall be at right angles to the centerline of the sidewalk.

3.08 Placing and Finishing Concrete

All concrete shall be placed on a prepared unfrozen, smooth, leveled, rolled and properly compacted base as indicated on the Plans. The surface of the subbase shall be moist with no visible water present prior to placement of the concrete.

The concrete shall be deposited, in a single layer, to the depth specified in the Plans or in the Proposal. The concrete shall be thoroughly spaded or vibrated and compacted to fill in all the voids along the forms and joints. The concrete shall be struck off with a strike board until all voids are removed and the surface has the required grade and cross section as indicated on the Plans.

The surface of the concrete shall be floated just enough to produce a smooth surface free from irregularities. All edges and joints shall be rounded with an edger having a 1/4 inch (5 mm) radius. The surface of sidewalks, driveways and approaches shall be broomed to slightly roughen the surface.

The surface of sidewalk ramps shall be textured with a coarse broom transversely to the ramp slope. The texture on sidewalk ramps shall be coarser than the remainder of the sidewalk.

3.09 Curing

After finishing operations have been completed and immediately after the free water has left the surface, the surface of the concrete (and sides if slip-forming is used) shall be completely coated and sealed with a uniform layer of white membrane curing compound. The curing compound shall not be thinned. The curing compound shall be applied at the rate of 1-gallon per 200 square feet (4 L per 20 m²) of surface.

3.10 Barricades

Suitable barricades and lights shall be placed around all newly poured sidewalks, sidewalk ramps, driveways, driveway approaches and curb and gutter section in order to protect the new Work from damage from pedestrians, vehicles and others until the concrete has hardened.

Barricades shall be left in place for a minimum of two (2) days, except for driveway approaches and curb and gutter section. Barricades shall remain in place for a minimum of three (3) days.

Any concrete that suffers surface or structural damage shall be removed and replaced by the CONTRACTOR at his expense.

3.11 Protection

The CONTRACTOR shall adequately protect the new concrete from the effects of rain before the concrete has sufficiently hardened. For this Work the CONTRACTOR shall have available on the job site at all times enough burlap or 6-mil thick polyethylene film to cover and protect one (1) day's work. When rain appears eminent, all operations shall stop and personnel shall begin covering. As soon as the rain ceases, the concrete shall be uncovered and the surface burlap dragged where necessary. Curing compound shall be applied to any areas where the compound has been disturbed or washed away.

If concrete is placed between October 15 and May 15, the CONTRACTOR shall have available on the site sufficient amount of clean, dry straw or hay to cover one day's production. If the temperature reaches 40 degrees F (4° C) and is falling, the hay or straw shall be placed 12 inches (305 mm) thick, immediately after the curing compound is applied. If the temperature is 30 degrees F (-1° C) and falling the curing shall be by 6-mil thick polyurethane film placed on the concrete as soon as the surface moisture has disappeared, and then covered with 12 inches (300 mm) of straw or hay.

Also, whenever the temperature in the shade falls below 50 degrees F (10° C), the water, sand and coarse aggregate shall be heated in that order sufficiently to maintain a uniform

temperature of the concrete at between 70 degrees F and 80 degrees F (21° to 27° C).

Concrete shall not be placed when the temperature of the concrete at the point of placement is above 90 degrees F (32° C).

3.12 Cleanup

After the concrete has gained sufficient strength, but no sooner than within 12 hours, the fixed forms shall be removed and the spaces on both sides shall be immediately backfilled with sound earth of topsoil quality. The backfill shall be compacted, leveled and left in a neat, workmanlike condition.

At a seasonally correct time approved by the ENGINEER, the disturbed area shall be raked, have topsoil placed thereon, fertilized and seeded per the requirements of Section 32 9219, Seeding, or sodded in accordance with Section 32 9223, Sodding.

3.13 Testing

The ENGINEER may require that a minimum of two cores be drilled from the sidewalk for each 500 (or fraction thereof) linear foot (150 m) section placed. At least one (1) core out of two (2) required will be taken from the sidewalk at the driveway. One (1) core may be required from every 20 (or fraction thereof) of driveway approaches or sidewalk ramps installed.

The cores shall be checked for depth and compressive strength. The core drilling and tests shall be done by a testing laboratory designated by the OWNER and at the expense of the OWNER. The testing laboratory shall furnish the ENGINEER with two (2) certified copies of the test results.

In the event the test results on a core indicates a deficiency in either thickness or compressive strength the following adjustments in the unit price for concrete shall be made:

Thickness

<u>Under Required Thickness</u>	<u>Percent of Reduction in Unit Price</u>
0" to 1/4" (0 to 5 mm)	None
by more than a 1/4", but not exceeding a 1/2" (56 mm to 10 mm)	20
by more than a 1/2", but not exceeding 1" (03 mm to 25 mm)	50
by more than 1" (greater than 25 mm)	Remove & Replace

Compressive Strength

<u>Under Required Compressive Strength</u>	<u>Percent of Reduction in Unit Price</u>
0 to 150 psi (0 to 1 MPa)	None
by more than 150 psi, but not exceeding 300 psi (1 MPa to 2 MPa)	20
by more than 300 psi, but not exceeding 500 psi (2 MPa to 3.5 MPa)	50
by more than 500 psi (Greater than 3.5 MPa)	Remove & Replace

The area of the deficient core shall be determined by the drilling and testing of two (2) additional cores, one (1) on each side of the deficient core and 20 feet (6 m) from it when possible. The extra core drilling and testing shall be at the expense of the CONTRACTOR. Reductions due to deficiencies in thickness or compressive strength are additive, that is, if an area is deficient by 3/8 inch (9 mm) and under strength by 200 psi (1.3 MPa), the total reduction is 20% plus 20% or 40% reduction.

End of Section

Section 32 1500 Aggregate Surfacing

Part 1 General

1.01 Scope

This section includes the requirements for constructing aggregate surfacing.

1.02 Related Work Specified Elsewhere

1. Unit Prices: Section 01 2200
2. Site Construction Performance Requirements: Section 01 8900
3. Subgrade Preparation: Section 31 2313
4. Bituminous Paving: Section 32 1216
5. Concrete Paving: Section 32 1313
6. Seeding: Section 32 9219
7. Sodding: Section 32 9223

1.03 Reference Standards

Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications:

ASTM- American Society of Testing and Materials

AASHTO- American Association of State Highways and Transportation Officials

MDOT- Michigan Department of Transportation, Standard Specifications for Construction, latest edition

1.04 Allowable Tolerances

The finished surface shall be shaped to conform to plan grade and cross section within a tolerance of 3/4 inch in ten (10) feet (30 mm per 5 m).

1.05 Test Reports

The testing lab shall provide the ENGINEER with two (2) certified copies of the test results of the thickness of the compacted aggregate. The core drilling, testing for thickness and the certification of the test results shall be performed by a testing laboratory approved by the ENGINEER.

1.06 Stockpiling Aggregate

Aggregate shall be deposited in stockpiles in such a manner that the material may be removed from the stockpile by methods which will provide aggregate having a uniform gradation.

Stockpiling of aggregate, in excess of four (4) feet (1.2 m) in depth, on the completed subbase or aggregate surface will not be permitted, except with the approval of the ENGINEER.

1.07 Environmental Requirements

Comply with the requirements for aggregate base or surfacing installations due to outside ambient air temperatures specified under Article 3.10 of this Section.

Part 2 Products

2.01 Dense-Graded Aggregate

The dense-graded aggregate gradation shall conform to dense-graded aggregate, Series 22 and 23 as specified in MDOT, Section 902.05.

2.02 Calcium Chloride Additives

The calcium chloride additives shall conform to ASTM D98 and as specified in MDOT, Section 903.04.

2.03 Water

Water used for compaction and dust control shall be reasonably clean and free from substances injurious to the finished product. Water from sources approved by the Michigan State Department of Public Health as potable may be used.

Part 3 Execution

3.01 Excavation Verification

Prior to the placing of any aggregate material, examine the excavation for the grades, lines, and levels required to receive the new Work. Ascertain that all excavation and compacted subgrades or subbases are adequate to receive the new Work. Correct all defects and deficiencies before proceeding with the Work.

3.02 Subgrade Conditions

Prior to the placing of any aggregate material, examine the subgrade or subbase to ascertain that it is adequate to receive the aggregate to be placed. If the subgrade or subbase remains wet after all surface water has been removed, the ENGINEER may require the installation of edge drain.

3.03 Existing Base

Prior to the placing of any aggregate material for surfacing, examine the existing base for grade and condition to receive the new Work. Ascertain that the base is adequately compacted to receive the aggregate surfacing to be installed.

Correct all defects and deficiencies before proceeding with the Work.

3.04 Existing Improvements

Investigate and verify locations of existing improvements, including structures, to which the new Work will be in contact.

Necessary adjustments in line and grade, to align the new Work with the existing

improvements must be approved by the ENGINEER, prior to any changes.

3.05 Preparation of Subgrade or Subbase

The subgrade or subbase shall be fine graded to the cross section indicated on the Plans, and shall be thoroughly compacted prior to the placing of the aggregate material.

3.06 Installation - General

The width, thickness, and type of aggregate materials shall be indicated on the Plans or as directed by the ENGINEER.

No aggregate material shall be placed until the subgrade, or subbase, or existing aggregate surface has been approved by the ENGINEER.

3.07 Aggregate Surface Course

Where the base for the new aggregate surface course is an existing aggregate surface, the existing surfacing, shall be either graded or scarified and graded to remove irregularities and to provide a bond between the old and new surfaces.

The aggregate surface course shall be placed by a mechanical spreader or other approved means, in uniform layers to such a depth that when compacted, the course will have the thickness shown on the Plans.

The depth of the surface course, when compacted, shall not exceed six (6) inches (150 mm), unless otherwise specified on the Plans or directed by the ENGINEER. The aggregate shall be of a uniform mixture when placed on the prepared base. It shall be uniformly spread and then trimmed with a road grader, trimmer or other approved means until the surface is free from waves and irregularities. The trimming shall be alternated by rolling with a pneumatic-tired or tamping type roller. The entire operation shall continue until the surface course is compacted to at least 95% of maximum unit weight.

When the operation is completed, the surface course shall conform to the required lines, grades and cross sections.

The optimum moisture content shall be maintained until the prescribed unit weight is obtained and each layer shall be compacted until the maximum unit weight is attained before placing the succeeding layer.

When approved by the ENGINEER, additional water may be applied by an approved means, to the aggregate to aid in the compaction and shaping of the material.

With the approval of the ENGINEER, chloride additives may be used by the CONTRACTOR to facilitate his compaction and maintenance of the aggregate surface. The amount and method of combining the chloride additives are at the option of the CONTRACTOR and are at his expense.

3.08 Aggregate Shoulders and Approaches

The construction of shoulders and approaches shall be of the material, width and depth as shown on the Plans.

When shoulders and approaches are specified by class, they shall conform to MDOT, Section 307 for shoulders and approaches specified as: Class I, Class II, Class III or Class IV.

The subgrade for the shoulders and approaches shall be graded to an elevation below the finished surface that will permit the placing of the specified thickness of materials.

The subgrade of shoulders and approaches shall be approved by the ENGINEER prior to the placing of aggregate.

The aggregate shall be placed on the prepared subgrade by a mechanical spreader or other approved means, to a depth of not more than five (5) inches (125 mm). If the specified thickness exceeds five (5) inches (125 mm), the shoulder or approach shall be constructed in two or more courses.

Dumping the aggregate on the road surface and grading it onto the shoulder or approach will not be permitted.

The aggregate shall be compacted to not less than 100% of the maximum unit weight for the

first five (5) feet (1.5 m) outside of the pavement edge and 98% of the maximum unit weight for the remainder of the area. When the operation is completed, the surface course shall conform to the required lines, grades and cross sections.

On resurfacing projects, the existing aggregate shoulder or approach shall be scarified prior to the placing of new aggregate materials. The placement of aggregate shall proceed the placing of the top course of bituminous mixture on the adjoining pavement. Final shaping and compaction of the shoulder or approach shall follow the placement of the top course of bituminous mixture unless otherwise directed by the ENGINEER.

The optimum moisture content shall be maintained until the prescribed unit weight is obtained and each layer shall be compacted until the maximum unit weight is attained before placing the succeeding layer.

When approved by the ENGINEER, additional water may be applied by an approved means, to the aggregate to aid in the compaction and shaping of the material.

With the approval of the ENGINEER, chloride additives may be used by the CONTRACTOR to facilitate his compaction and maintenance of the aggregate surface. The amount and method of combining the chloride additives are at the option of the CONTRACTOR and are at his expense.

3.09 Maintenance During Construction

The aggregate surface shall be continuously maintained in a smooth and firm condition during all phases of the construction operation.

The CONTRACTOR, at his expense, shall provide additional materials needed to fill depressions or bind the aggregate.

3.10 Temperature Limitations

Aggregate materials shall not be placed when there are indications that the mixtures may become frozen before the maximum unit weight is obtained.

In no case shall the aggregate be placed on a frozen subgrade or base course unless otherwise directed by the ENGINEER.

3.11 Cleanup

Immediately following the compacting of the surface course, the voids on both sides of the aggregate course shall be backfilled with sound earth of topsoil quality.

The backfill shall be compacted, leveled and left in a neat, workmanlike condition.

At a seasonally correct time approved by the ENGINEER, the disturbed area shall be raked, have topsoil placed thereon, fertilized and seeded per the requirements of Section 32 9219, Seeding or sodded in accordance with Section 32 9223, Sodding.

3.12 Opening Aggregate Surfaced Roads

The ENGINEER reserves the right to open the aggregate surfacing to traffic at any time during construction.

3.13 Monument Boxes

All government, plat, and street intersection monuments within existing or proposed pavement shall be preserved by enclosing in standard monument boxes. Monument box castings shall be furnished and installed by the CONTRACTOR and shall be East Jordan Iron Works No. 1570, or approved equal.

Existing monument boxes shall be adjusted to meet the proposed pavement elevation by removing the castings and resetting to the required elevation. Support for the monument box shall be concrete bedding, so constructed as to hold them firmly in place. The adjacent pavement, curb, or curb and gutter shall be replaced to the new elevation, condition, and kind of construction, unless otherwise provided.

3.14 Testing

During the course of the Work, the ENGINEER may require testing for compaction or density and for thickness of material. The testing and coring required shall be performed by a testing

laboratory acceptable to the OWNER and approved by the ENGINEER. The cost for testing and coring shall be at the expense of the OWNER.

When thickness tests are done, a minimum of one depth (thickness) measurement will be made every 400 linear feet (120 m) per traffic lane. The lane width shall be as indicated on the Plans or as determined by the ENGINEER. If two (2) lanes are constructed simultaneously, only one test is necessary to represent both lanes. For areas such as intersections, entrances, cross-overs, ramps, widening strips, acceleration and deceleration lane, at least one depth measurement will be taken for each 1,200 square yards (1000 m²) of such areas or fraction thereof. The location of the depth measurement will be at the discretion of the ENGINEER.

The maximum unit weight when used as a measure of compaction or density of soils shall be understood to mean the maximum unit weight per cubic foot (or cubic meter) as determined by ASTM D1557, Method D.

3.16 Defective Work

A. Thickness

Measurements of aggregate base and/or surface course thickness will be made to the nearest 1/4 inch (5 mm). Depths may be 1/2 inch (10 mm) less than the thickness indicated on the Plans provided that the average of all measurements taken at regular intervals shall be equal to or greater than the specified thickness. In determining the average in place thickness, measurements which are more than 1/2 inch (10 mm) in excess of the thickness indicated on the Plans will be considered as the specified thickness plus 1/2 inch (10 mm).

Locations of the depth measurements will be as specified herein unless otherwise directed by the ENGINEER. Sections found to be deficient in depth shall be corrected by the CONTRACTOR using methods approved by the ENGINEER.

B. Weight

When the aggregate material is measured by weight in Tons (or metric tons), the pay weights for aggregates will be the scale weight of the material, including admixtures, unless the moisture content is more than six (6) percent. Moisture tests will be made at the start of weighing operations and at any time thereafter when construction operations, weather conditions or any other cause may result in a change in the moisture content of the material. If the tests indicate a moisture content in excess of six (6) percent, the excess over six (6) percent will be deducted from the scale weight of the aggregate until such time as moisture tests indicate that the moisture content of the material is not more than six (6) percent.

End of Section

Section 32 3100 Fences and Gates

Part 1 General

1.01 Scope

This Section includes the types of fencing work indicated on the Plans complete with layout of the Work, excavation and backfill, concrete foundation, fence framing and fabric, pickets and privacy slats, gates and hardware, and hardware adjustment and lubrication.

1.02 Related Work Specified Elsewhere

1. Unit Prices: Section 01 2200
2. Site Construction Performance Requirements: Section 01 8900

1.03 Reference Standards

Unless otherwise specified, the Work of this Section shall conform to the applicable portions of the following Standards:

ASTM- ASTM International

AWPA- American Wood Preserves Association

PS- U.S. Department of Commerce, National Bureau of Standards Product Standard

FS- Federal Specifications

MDOT- Michigan Department of Transportation, Standard Specifications for Construction, latest edition

1.04 Submittals

Submit manufacturer's literature showing standard details of fence and gate materials.

Submit Shop Drawings showing details of fence and gate fabrication and installation.

Part 2 Products

2.01 General

Framing members for fence and gate framing shall be fabricated of the types and sizes of steel framing indicated on the Plans and as specified in this Section. As a minimum, framing members shall conform to the requirements in the Articles in Part 2 of this Section. Framing members, posts, rails, and accessories shall be PVC coated when the fence fabric is PVC coated.

Tubular Sections shall be hot-dipped galvanized steel tubular materials conforming to ASTM A53 for weight and coating. Steel tubular framing may be welded or seamless steel pipe reasonably straight and free from injurious defect. Burrs at ends of pipe shall be removed. The average weight of the finished steel pipe shall not be less than 95% of the weight specified, which shall include the weight of galvanizing.

Structural and roll-formed steel shapes conforming to ASTM A499, hot-dipped galvanized in accordance with ASTM A123. Framing members of structural and roll-formed shapes shall be fabricated of new rail steel billets, of the weights specified and galvanized. The weight of the zinc coating per square foot of actual surface shall average not less than 2.0 ounces (55 g) and no individual specimen shall show less than 1.8 ounces (50 g). All weight specified for structural and roll-formed shapes shall include the zinc coating, except that any weight of galvanizing over 4.0 ounces of zinc per square foot (1kg/m^2) of surface shall be deducted from the weight.

2.02 Posts and Rails

Posts shall be round pipe or square rolled formed sections conforming to the dimensions and weights specified herein.

Round posts shall be hot dipped galvanized with a minimum average zinc coating of 1.8 oz/ft^2 (0.55 kg/m^2) meeting ASTM F1083 for standard weight (Schedule 40) galvanized pipe.

Rolled form sections shall be produced from steel having minimum yield strength of 45,000 psi (310 mPa) and meet the strength and protective coating requirements of ASTM F1043.

A. Intermediate Posts

Intermediate posts shall be round or square conforming to the following weights and dimensions (O.D.):

1. For fabric 6.0' (1.83 m) or less: 1.90" (48.3 mm) round weighing 2.72 lbs/ft (4.05 kg/m)
2. For fabric 7.0' to 10' (2.1 m to 3.0 m): 2.375" (60.0mm) round, weighing 3.65 lbs/ft (5.43 kg/m); or 2.0" (50.8 mm) square weighing 2.60 lbs/ft (3.87 kg/m).
3. For fabric over 10.0': 2.875" (73 mm) round weighing 5.79 lbs/ft (8.62 kg/m); or 2.5" (63.5 mm) square weighing 5.10 lbs/ft (7.6 kg/m).

B. Terminal Posts, Angle Posts, Pull Posts and Brace Posts

Round or square conforming to the following weights and dimensions (O.D.):

1. For fabric 6.0' (1.83 m) or less: 2.375" (60.0mm) round, weighing 3.65 lbs/ft (5.43 kg/m); or 2.0" (50.8 mm) square weighing 2.60 lbs/ft (3.87 kg/m).
2. For fabric 7.0' to 10' (2.1 m to 3.0 m): 2.875" (73 mm) round weighing 5.79 lbs/ft (8.62 kg/m); or 2.5" (63.5 mm) square weighing 5.10 lbs/ft (7.6 kg/m).
3. For fabric over 10.0': 4.0" (101.6 mm) weighing 8.65 lbs/ft (12.88 kg/m); or 2.5" (63.5 mm) square weighing 5.10 lbs/ft (7.6 kg/m).

C. Gate Posts

Gate posts shall be round or square conforming to the weights and dimensions (O.D.) in Table A.

D. Top Rail, Bottom Rail, and Middle Rail

Round pipe: 1.66 inches (42 mm) weighing 2.27 pounds per linear foot (3.38 kg/m).

Top rail lengths shall be not less than 18-feet (5.5m) and fitted with couplings or swaged for connecting the lengths into a continuous run. Couplings shall be not less than 6-inches (152.4 mm) long, with 0.070 inch (1.75 mm) minimum wall thickness and shall allow for expansion and contraction of the rail.

2.03 Bracing Truss

Diagonal truss: 3/8 inch (9.5 mm) nominal diameter rod with adjustable take-up.

2.04 Accessories

Post tops, extension arms, stretcher bars, rail ends and appurtenances shall be malleable iron or heavy pressed steel and galvanized in accordance with ASTM A153.

Post tops on fences with a top rail shall be provided with a hole suitable for passing the top rail through the post top and shall fit over the outside of the post with a weathertight closure.

Extension arms for supporting barbed wire shall be a single or "V" type as shown on the Plans, and extend from the top of the post at an angle of approximately 45 degrees. Arms shall be integral with post tops. Extension arms shall carry three (3) barbed wires equally spaced with the topmost wire approximately 12 inches (300 mm) above the fence fabric.

Stretcher bars shall be one piece lengths equal to the full height of the fence fabric. Bands shall be approximately 1-inch (25 mm) wide with beveled edges to secure stretcher bars to end, corner, pull and gate posts.

2.05 Woven Wire Fabric

Woven wire fabric shall be fabricated in accordance with the best commercial practices. The overall width of the fabric shall be not less than 46-1/2 inches (1.2 m). Fabric stays shall be uniformly spaced on 6-1/4 inch (160 mm) centers maximum.

Galvanized steel woven wire fabric shall conform to ASTM A116, No. 11 Farm Fencing, Design Number 1047-6-11, Grade 60, Class I, Zinc Coating.

Aluminum-coated steel woven wire fencing shall conform to ASTM A116, No. 11 Farm Fencing, Design Number 1047-6-11, Class I, Aluminum Coating.

2.06 Chain Link Fabric

Fabric shall be zinc (galvanized) coated, vinyl coated or aluminum coated. Zinc coated fabric shall be galvanized after weaving.

Unless otherwise indicated on the Plans or directed by the ENGINEER, chain link fabric regardless of type, shall be 11 gauge (3.05 mm), zinc coated steel. Mesh shall be two (2) inches (50 mm). Fabric 72 inches (1830 mm) in height and over shall have both selvages knuckled. Fabric less than 72 inches (1830 mm) in height shall have the top selvage knuckled.

Zinc-Coated Steel Chain-Link Fence Fabric shall conform to ASTM A392, Class 2 Coating.

Aluminum-Coated Steel Chain-Link Fence Fabric shall conform to ASTM A491, and ASTM A817.

Vinyl-Coated Steel (Extruded Vinyl over Galvanized Steel Wire) Chain-Link Fence Fabric shall conform to ASTM F668, Class 2a.

Fused Vinyl-Coated Steel (Thermally Fused Vinyl Coating over Galvanized Steel Wire) Chain-Link Fence Fabric shall conform to ASTM F668, Class 2b.

2.07 Barbed Wire

Barbed wire shall be fabricated of 2-strand, 12-1/2 gage (2.50 mm) zinc-coated steel wire (Type Z, Class 3) with 4-point, 14-gage round barbs spaced on 5-inch (125 mm) centers conforming to Design Number 12-4-5-14R of ASTM A121. Wire shall be galvanized after fabrication.

2.08 Tension Wire

Tension wire shall be No. 7 gage (4.50 mm) ASTM A824 with a Type I aluminum coating, a Type II, Class 2 zinc coating, or shall be hot dipped with a Type II, Class 1 galvanized coating followed by a thermally fused vinyl coating. Tension wire shall have a minimum breaking strength of 1,950 pounds (8670 N).

2.09 Fabric Fasteners

Fasteners for securing fabric to framing members shall be No. 12 gage (2.68 mm) minimum, galvanized, aluminum coated or vinyl coated as compatible with fabric.

Hog rings shall be 11-gage (3.05 mm) minimum galvanized, aluminum or vinyl coated as compatible with fabric.

Coatings for fasteners shall conform to the requirements of ASTM A641, Class III.

2.10 Wood Posts

Wood posts will only be acceptable when woven wire fencing is specified on the plans or in the Proposal. Wood posts shall be Cedar, Red Oak, White Oak, Beech, Hard Maple, White Ash, Yellow Birch, Norway Pine, Northern White Pine or other species acceptable to the ENGINEER.

Posts shall have been cut from timber seasoned by stacking in a manner acceptable by the ENGINEER. Timber as a minimum shall be equal to No. 3 Grade Southern Pine.

2.11 Wood Framing, Pickets, and Gates

Framing pickets and gates used in woven wire fencing shall conform to the requirements of U.S. Department of Commerce Standard for Softwood Lumber (PS 20) for the specific application as described in ASTM F537. Wood bracing shall be either Cedar Oak or other approved wood poles not less than 4-1/2 inches (115 mm) in diameter.

2.12 Wood Preservatives

The applicable requirements of AWWPA U1, Section 6, Commodity Specification A, Use Category 4B shall apply for all preservative pressure treated wood fencing materials.

Brush coated treatment of wood fencing materials shall conform to the applicable portions of AWWPA Standard M4.

Oil-born treatment of wood fencing materials is not acceptable.

2.13 Metal Fasteners for Woven Wire Fencing

All metal fasteners used in the construction and installation of woven wire fencing shall be corrosive-resistant type conforming to ASTM F537 unless otherwise indicated on the Plans. Staples shall be No. 9 gage (3.75 mm) steel wire, 1-1/2 inch (40 mm) minimum for softwood and 1-inch (25 mm) minimum for hardwood.

2.14 Privacy Slats

Privacy slats where shown shall be of type and sizes indicated on the Plans.

Wood for privacy slats shall be graded and finished as recommended by the California Redwood Association for landscaping wood.

2.15 Concrete

In accordance with MDOT Section 601, use Grade P2; 3,000 psi (21 MPa) strength; Type IA cement; 5.5 sacks cement per cubic yard (306 kg/m³); 6A coarse aggregate; 2NS fine aggregate; 6.5% ± 1.5% air content; 4-inch (100 mm) maximum slump; no admixtures without the ENGINEER's approval.

2.16 Gates

Frames for gates shall be fabricated of Zinc-coated steel frames in accordance with ASTM F1043. Welded joints shall be coated in accordance with Practice A780, employing zinc rich primer. Gates shall be provided with intermediate braces and truss rods of sufficient strength to form a rigid frame without twist or sag. Members shall not sag in excess of the lesser of 1% of the gate leaf width or 2-inches (50 mm).

Gate frame members shall be in accordance with Table B, minimum.

Fabric used for gates shall be the same as that used for fencing unless otherwise indicated on the Plans. Install fabric with stretcher bars at vertical edges, and tie wires at top and bottom edges.

Install stretcher bars to gate frame at not more than 15-inch (300 mm) centers. Attach hardware with approved fasteners that will provide security against removal or breakage.

Hinges shall be non-lift-off type, offset to permit 180-degree gate opening. Hinges shall be

structurally capable of supporting the gate leaf and allow the gate to open and close without binding. The hinges shall be so designed to permit the gate to swing a full 180°.

Latch shall be forked or plunger bar type with integral padlock eye and shall be operable from either side of gate.

Keeper, where required, shall automatically engage the gate leaf and hold it in the open position until manually released. Keepers shall be provided on each gate leaf over 5-ft. (1.5 m) wide.

Double gates shall be provided with mushroom type or flat plate gate stops and anchors. Stops shall be designed to engage the center drop rod or plunger bar of both leaves.

Sliding gates shall comply with ASTM F1184. Slide gates shall be horizontal slide gates supported only from above or cantilever slide gates spanning an opening without a top or bottom support as indicated on the plans. Cantilever slide gates shall be supplied with zinc coated steel frames using external or internal rollers per ASTM F1184.

Part 3 Execution

3.01 Final Grading

Verify that final grading in the area to receive fencing has been completed. Grades shall be without irregularities that would interfere with the fence installation. Report all discrepancies in final grades that would interfere with the new Work to the ENGINEER. Do not commence Work until all unsatisfactory conditions have been corrected.

3.02 Measurement and Layout

Measure and layout the complete fence line as indicated on the Plans. All measurements for installation of fence work shall be measured parallel to the surface of the ground.

Do all locating and marking of fencing post positions. Locate line posts at equal spacings, center to center, as indicated on the Plans and specified in this Section. Locate and mark corner

post positions at changes in fencing runs exceeding 30 degrees.

3.03 Installation - General

Installation of fencing and gates shall meet the requirements of ASTM F567 and Chain Link Manufacturers Institute, Product Manual CLF 2445. All work shall be installed in accordance with the best trade practices, to the best workmanship and in a manner acceptable to the ENGINEER. The finished fence shall be plumb, taut, true to line and ground contour and rigidly secured in position.

3.04 Installation of Woven Wire Fence

Line posts shall be spaced not more than 16'-6" (5 m) center to center. Line posts adjacent to any end, corner, gate or intermediate braced post shall be spaced not more than ten (10) feet (3 m), center-to-center.

Posts shall be set in holes dug minimum depth of 4'-6" (1.5 m) except that a tolerance of \pm three (3) (75 mm) inches is permitted provided the exposed portion of the post will not be less than 4'-4" (1.1 m). Posts shall be set with large end down, plumb on side to receive fabric.

Angle posts shall be installed where a deflection in fence alignment exceeds 30 degrees. Install intersection posts in line of intersecting fencing runs. Intersecting runs of fence shall be connected to a common post.

Metal posts shall be driven with a suitable driver acceptable to the ENGINEER. Metal posts shall be driven to the proper depth, plumb and in conformity with fence lines indicated on the Plans. Metal posts which are bent or otherwise damaged during driving shall be removed and replaced.

End, corner, gate, angle, intersection and intermediate braced posts shall be set in concrete at least 18 inches (450 mm) in diameter and 4'-6" (1.5 m) deep. Braces shall be set in concrete at least 18 inches (450 mm) in diameter and 18 inches (450 mm) deep. Corner, angle and intermediate braced posts shall be braced in both directions. Intersection posts shall be braced in three (3) directions. Braces shall be securely fastened to the post near the top. At all grade depressions and alignment angles, line posts shall

be set in concrete at least 18 inches (450 mm) in diameter and 4'-6" (1.5 m) deep.

Woven wire fabric shall be installed to the lines and levels indicated on the Plans. Fabric shall be stretched taut and securely fastened to each post with the bottom of the fabric approximately two (2) inches (50 mm) above the ground. Each horizontal strand of wire shall be wrapped completely around the end, corner, gate, intermediate braced or angle post and securely fastened by winding the end about the wire where it leads up to the post. Line posts shall not be used as a stretching anchorage.

Splicing of wire in woven wire fabric and barbed wire shall be accomplished in a manner which will develop the full strength of the wire. The distance between the vertical stays adjacent to the splice shall be the same as for the unspliced sections of the fabric. One (1) approved splice may be placed at the end of the roll of fence without regard to the distance from a post.

Fabric shall be securely fastened to each metal post with at least six (6) wire clamps.

Fabric shall be attached to each wood post by at least one (1) fastener for each horizontal stand and as many other fasteners as required to secure wire firmly to post.

Fabric shall be topped with barbed wire as indicated on the Plans. Barbed wire shall be securely fastened to each post.

Gates shall be erected using methods acceptable to the ENGINEER in the locations shown on the Plans.

3.05 Installation of Chain Link Fence

Posts for chain link fence shall be set and braced as indicated on the Plans, as specified herein, or if not indicated, installation shall meet the requirements of ASTM F567 and Chain Link Manufacturers Institute, Product Manual CLF 2445.

Line posts shall be spaced not more than ten (10) feet (3 m) center-to-center. Angle posts shall be installed where a deflection of ten (10) degrees or more occurs in fence alignment.

Intermediate, braced posts shall be spaced at 660-foot (200 m) intervals or midway between end

posts, angle posts or corner posts when this distance is less than 1,320 feet (400 m) but more than 660 feet (200 m).

Intersection (corner) posts shall be set in line with intersecting fences. Both intersecting fences shall be connected to the common post.

Posts shall be set in concrete. The depth of concrete footings for line posts shall be not less than 3'-6" (1 m). Footing diameters shall be nine (9) inches (225 mm) minimum for line posts. Footing diameters for end, corner, angle, intersection, gate and intermediate braced posts shall be 18 inches (450 mm) minimum. Holes for post foundations shall be completely filled with concrete around post.

All fences shall have at least a top rail and a bottom tension wire. Fences 10-feet or more in height, and where otherwise indicated on the plans, shall have center and bottom rails. Bottom and center rails shall be securely connected to posts by means of connections approved by the ENGINEER.

The top rail shall pass through the line post tops to form a continuous brace from end to end of each stretch of fence fabric. Splice joints shall be provided as indicated on the Plan. Suitable ties or clips shall be provided for attaching the fabric securely to the top rail at intervals not exceeding 24-inches (610 mm).

The top, center and bottom rail shall be secured to gate, corner, pull, end and line posts as indicated on the Plans.

Horizontal braces of fencing six (6) feet (1830 mm) high and over shall be securely fastened to all end, corner, angle, intersection, gate, and intermediate braced posts by means of suitable metal connections. Braces shall be positioned midway between top rail and ground and shall extend to the first line posts. Braces shall be trussed as indicated on the Plans.

All posts shall be fitted with post tops.

Install chain link fabric of height indicated on plans. Fabric shall be pulled taut and tied to posts, rails and tension wires. Fabric shall be secured to framing by means of suitable metal bands, hogs or clips. Fasteners shall be spaced not more than 12 inches (300 mm) apart on posts and

not more than 15 inches (375 mm) apart on top rail. Hogs rings for connecting fabric to tension wire shall be spaced on not more than 24-inch (600 mm) centers.

Install extension arms as indicated on the Plans. Intermediate extension arms shall have hole for passage of top rail. Extension arm shall carry three (3) barbed wires equally spaced with the topmost barbed wire approximately 12 inches (300 mm) in or out from the fence line.

Provide one (1) stretcher bar for each gate and end post; provide two (2) stretcher bars for each center and pull post. Thread bars through fabric and secure to post with metal bands on 15-inch (375 mm) centers maximum.

Fasten tie wires where shown and as required. Use U-shaped clips of wire securely fastened around pipe for clasping pipe and fabric. Bend ends of tie wire to minimize hazard to personnel and clothing.

Install gates of types and sizes and in locations indicated on the Plans. Install ground-set items in concrete for anchorage as recommended by the manufacturer of the chain link fence. Lower hinge of gate shall be placed on top of concrete footing in which gate post is set. The footing concrete shall extend up to the bottom of the lower hinge. Cone bolt sockets for double swing gates shall be set in concrete so that plunger pin fits in socket when gate is in closed position. Gates shall be erected to swing in direction indicated. Install gate stops to limit swing as shown on Plans. Gates shall be hung plumb, level and secure for full opening without interference.

Privacy slats, where used, shall be of types and sizes indicated on the Plans. Slats shall be secured to fabric using suitable clinch-lock type fasteners acceptable to the ENGINEER. Slats shall be secured to fabric by suitable metal fasteners on 6-inch (150 mm) vertical centers.

3.06 Adjustment

After erection of all fence, adjust all gate hardware for smooth and positive operation.

3.07 Post Leveling

After erection of all fences, the tops of wood posts shall be cut off to proper elevation.

3.08 Lubrication

End of Section

After completion of fence erection, lubricate all moving parts of gate hardware to insure smooth operation without binding.

Table A. Dimension and Weight of Gate Posts

Gate Leaf Width	Outside Dimension in. (mm)	Min Weight lbs/ft (kg/m)
For fabric Ht. 6.0 ft (1.8 m) or less		
4.0' (1.2 m) or less - round	2.375" (60.3)	3.65 (5.43)
- square	2.00" (50.8 mm)	2.60 (3.87)
over 4' to 10' (1.2 m to 3.7m) - round	2.875" (73.0)	5.79 (8.62)
- square	2.50" (63.5)	5.10 (7.60)
Over 10' to 18' (3.7 m to 5.5 m) - round	4.00" (101.6)	8.65 (12.88)
- square	2.50" (63.5)	5.10 (7.60)
For fabric Ht. over 6.0 ft (1.8 m)		
6.0' (1.2 m) or less - round	2.875" (73.0)	5.79 (8.62)
- square	2.50" (63.5)	5.10 (7.60)
over 6' to 12' (1.2 m to 3.7m) - round	4.00" (101.6)	8.65 (12.88)
- square	2.50" (63.5)	5.10 (7.60)
Over 12' to 18' (3.7 m to 5.5 m) - round	6.625" (168.3)	18.02(26.82)
Over 18' to 24' - round	8.625 (219.1)	27.12 (40.36)

Table B. Gate Frame Members, Dimensions and Weights

Gate Fabric Height	Outside Dimension in. (mm)	Minimum Weight lbs./ft (kg/m)
For fabric Ht. 6.0 ft (1.8 m) or less		
Round tubular steel	1.66" (42.2)	1.83 (2.72)
Rectangular tubular steel	1.5" (38.1)	1.84 (2.74)
For fabric Ht. over 6.0 ft (1.8 m)		
Round tubular steel	1.90" (48.3)	2.28 (3.39)
Rectangular tubular steel	2.00" (50.8)	2.52 (3.75)
Interior Bracing		
Round steel pipe	1.66" (42.2)	1.83 (2.72)
Rectangular Steel	1.5" (38.1)	1.84 (2.74)

Section 32 9000 Planting

Part 1 General

1.01 Scope

This Section includes furnishing trees, shrubs and ground cover as shown on the Plans, complete with the digging and preparation of holes, furnishing and placing of topsoil, planting, pruning, watering, fertilizing and cultivating; weed control fabric, and such other materials necessary to complete the Work and insure proper and hardy growth.

1.02 Related Work Specified Elsewhere

1. Unit Prices: Section 01 2200
2. Site Construction Performance Requirements: Section 01 8900

1.03 Source Quality Control

All trees, shrubs and ground cover shall comply with the state and federal laws with respect to inspection for plant diseases and insect infestation.

1.04 Reference Standards

AAN-	American Association of Nurserymen
AANLS-	American Association of Nurserymen Landscape Standards
ANSI -	American National Standards Institute
ASTM -	American Society for Testing and Materials
MDOT -	Michigan Department of Transportation Standard Specifications for Construction, latest edition

1.05 Submittals

The CONTRACTOR shall submit to the ENGINEER certificates of inspection for plant diseases and insect infestation.

Submit a certified analysis of imported topsoil from each off-site source prior to delivery. Deficiencies shall be corrected at CONTRACTOR's expense.

Submit sample of mulch and planting mixture prior to delivery to site.

Submit product data for anti-desiccants, tree wound dressing and herbicides prior to use.

1.06 Plant Selection and Inspection

All trees shall be inspected and accepted prior to planting. The CONTRACTOR may elect either of the following options as applicable:

For sources within 120 miles of the site, the ENGINEER will tag the trees at the source. The CONTRACTOR shall request, in writing, at least two weeks prior to any desired inspection date, inspection and approval of the trees at the source. Approved trees will be tagged by the ENGINEER and the tag shall remain on the tree until planting and final inspection. The CONTRACTOR shall accompany the ENGINEER on the inspection.

Otherwise, the trees will be delivered to the site. Trees approved for use will be tagged by the ENGINEER and the tag shall remain on the tree until planting and final inspection. Rejected trees will not be tagged and shall be immediately removed from the site, and new trees shall be brought in for inspection and approval.

All plant material shall be subject to approval by the ENGINEER at the site prior to planting.

1.07 Preparation of Shipments

All plant material shall be clearly labeled as to species and variety. The label or tag shall be securely attached to each plant and shall show

the scientific name of the plant. Unless otherwise shown on the Plans, all plants shall be balled and burlapped or container grown.

In preparation for spring planting, all balling operations for balled and burlapped stock shall be completed prior to "bud break." In preparation for fall planting of deciduous plants, balling operations shall not commence until after the plants have begun to "harden off." All stock shall be dug and packed with care immediately prior to shipment. Plants shall be dug and transported so as to provide and retain a firm ball of earth. The roots shall be carefully protected with wet straw, moss or other material. The root balls shall be adequately protected from rain or sudden changes in the weather. Balled and burlapped plants will not be accepted if the balls of earth are loosened or broken, or wrapped with material made from synthetics or plastic.

Plants furnished in containers shall have their roots well established in the soil mass and shall have grown in the container for at least one (1) growing season. Containers shall be of a size large enough to provide an earth-root mass of adequate diameter and depth for the stem diameter and plant height or spread, as established by accepted nursery practice. No container grown stock will be accepted if it is root bound.

The transporting of all nursery stock shall be in an enclosed or covered vehicle. Deliver plant material immediately prior to planting. Keep plant material moist.

All plants will be rejected when the ball of earth surrounding the roots has been cracked or broken prior to or during the planting.

All plants shall be rejected when the burlap, stakes, or ropes required in connection with transplanting have been displaced prior to final acceptance.

1.08 Storage and Handling

The roots of all plants shall be kept moist and adequately protected by topsoil or other approved covering until planted.

The trunks and branches of all trees shall be carefully protected from injury of any kind during all operations of digging, loading, transporting and planting. Any trees that are injured may be rejected.

1.09 Planting Season

The planting seasons for deciduous plants shall be between March 1 and June 1 and from October 1 until the ground becomes frozen, except that, when unusual planting conditions exist or when container-grown material is used, these planting seasons may be altered. When approved by the ENGINEER, plants, having a ball of earth attached, may be planted during the summer months, provided adequate moisture will and can be applied to the plants.

The planting season for evergreen plants shall be between March 1 and June 1.

1.10 Guarantee and Acceptance

The CONTRACTOR shall warrant that all trees have been grown, transported, handled and planted properly so as to be in a vigorous growing condition at the start of the establishment period.

All trees, shrubs and ground cover shall be guaranteed for the establishment period(s). The CONTRACTOR shall replace all trees, shrubs and ground cover showing defective growth, more than 20% dieback, disease, insect infestation or other impairing defects during the Establishment Period with sound, healthy, vigorous growing trees, shrubs and ground cover at no additional expense to the OWNER and in accordance with the plans and specifications.

At the end of the Establishment Period, the CONTRACTOR shall request final acceptance. Final acceptance will be made by the ENGINEER and OWNER provided the trees are healthy and all requirements of the Project have been fulfilled.

1.11 Experience and Qualifications

The CONTRACTOR or Subcontractor must be experienced and capable of completing the Work so that the plant materials are in a healthy,

vigorous growing condition at the end of the Project. In order to show that the CONTRACTOR or Subcontractor is capable of completing the Work in successfully, when requested by the ENGINEER, the CONTRACTOR shall submit references from the last five (5) projects of a similar nature. Failure to show successful completion of the last five projects of a similar nature may result in the CONTRACTOR or Subcontractor being deemed unacceptable for this Work on this Project.

Part 2 Products

2.01 Trees and Shrubs

All trees and shrubs shall conform to the requirements of AANLS and as specified herein.

Plant material shall conform to the sizes given in the plant list or Proposal. All measurements such as spread, ball size, number of canes, quality designations, etc. shall be in accordance with AAN "American Standard for Nursery Stock".

Plant material shall be typical for their species or variety and shall be sound, healthy, vigorous, and free from plant diseases and insect pests or their eggs. They shall have healthy, well developed root systems.

Plants designated "B&B" shall be balled and burlapped. They shall be dug with firm, natural balls of earth of sufficient diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant. Balls shall be securely wrapped with burlap and bound with cord. No balled and burlapped plant shall be planted if the ball is cracked or broken. No planting with rot proof burlap or ties shall be permitted. Sand balls are not acceptable.

All trees shall be nursery grown stock which has been pruned to encourage single main stems, compact fibrous root systems and symmetrical branching. Trees of the same species shall be uniform in height and spread. All trees shall be free from all insects, diseases, mechanical injuries or other objectionable features. Root

balls shall be of the sizes specified in AANLS for the tree root system.

Container-grown stock shall have been grown in the containers for one (1) growing season minimum. Plants showing "Pot Bound" root ends will not be accepted.

Trees caliper for trees less than 4-inch (100 mm) caliper shall be determined at a point six (6) inches (150mm) above ground when installed. Trees above 4-inch (100 mm) caliper shall be measured at a point twelve (12) inches (300 mm) above the ground.

Ornamental trees and shrubs shall be well formed and shall have a crown typical of the species or variety. Low-branched crown types shall be furnished, unless the Plans or Proposal specify a tree form or a bush form. Material shall be balled and burlapped, unless otherwise indicated. Plant stock shall have grown to the required size in a normal progressive manner. Heading-back plants to meet sizes called for on the Plans will not be permitted.

Evergreen trees of all sizes will require ball and burlap or other adequate root protection. Tops shall be of a form typical to the species and not unnaturally sheared or color treated. Anti-desiccant protection may be required for evergreen trees.

Plant material shall be nursery grown at sources in the same or higher hardiness zone as determined by the latest edition of the Plant Hardiness Zone Map, Agricultural Research Service, U.S. Department of Agriculture.

Substitutions will be permitted only upon submission of proof that specified plants are not obtainable and with the authorization of the ENGINEER. All requests for substitutions and price adjustments due to substitutions must be submitted in accordance with the General Conditions.

2.02 Mulching

Mulching material shall be one of the following as specified on the plans.

A. Compost

Compost shall be mature/stabilized, humus-like material derived from the aerobic decomposition of yard waste (i.e., grass clippings and leaves) or other materials as designated compostable as defined in P.A. 641 as amended and shall be in compliance with all federal and state laws. The compost shall have a dark brown or black color, be capable of supporting plant growth without ongoing addition of fertilizers or other soil amendments and shall not have objectionable odor. The mixture shall be free of glass, plastic, metal, and other contaminants, as well as viable weed seeds and other plant parts capable of reproducing. The mixture shall be such that no visible water or dust is produced when handling it.

The manufacturer of the compost shall maintain annually on file with the Michigan Department of Agriculture, Pesticide and Plant Pest Management Division, test data and a statement to show that the following criteria are being met by the compost provided for the project.

1. The composition of the compost shall be within the following range of values

Quality Parameter	Range of Value
Soil pH	6 to 7.5
Soluble Salts	2 to 5 mmho/cm
Carbon/Nitrogen Ratio	13 to 20 parts Carbon to 1 part Nitrogen
Inerts	< 1%
Organic matter	35 to 55 %
Nitrogen	1 to 2 %
Phosphorus	0.2 to 0.8 %
Potassium	0.5 to 1.5 %
Unit Weight	535 to 775 Kg/m ³
Moisture Content	40 to 50 %
Particle Size	< 20 mm maximum
Water Holding Capacity	> 100%
Heavy Metals	None

2. Maturity/Stabilization – An acceptable test that can demonstrate Maturity/Stability.

3. Temperature – The compost material must have undergone the procedure to significantly reduce the pathogen level as referenced in EPA 40 CFR, Part 257 Regulations, Federal Register Vol. 58, No. 32, dated 2/19/93; Rules and Regulations. The temperature must be maintained at 40° C for 5 days with a temperature exceeding 55° C for at least 4 hours.
4. Pathogens and Trace Elements – Shall meet the requirements of EPA 40 CFR; Part 503 Regulations, Federal Register Vol. 58, No. 32, dated 2/19/93; Rules and Regulations.

To comply with the annual filing requirements with the Michigan Department of Agriculture, Pesticide and Plant Management Division, the supplier of the compost shall certify that the compost meets Michigan P.A. 641 as amended and EPA 40 CFR, Part 257 and 503 Regulations, Federal Register Vol. 58, No. 32; dated 2/19/93; Rules and Regulations.

A data sheet shall accompany the certification. The data sheet shall show the following:

- Standard compost total nutrient test results, including N, P, K, Ca, Mg, Mn, Cu, Fe total carbon, pH, as provided by an acceptable testing laboratory
- Organic content
- Inert contamination
- Soluble salts
- Carbon/Nitrogen ratio
- Proof of maturity/stability acceptable to the Michigan Department of Agriculture

The certification and data sheets shall be mailed annually to the Michigan Department of Agriculture, Agriculture Environment Coordinator. The date shall be included on which the compost test results were mailed to the Michigan Department of Agriculture.

B. Wood Chips

Wood chips shall be the product of a mechanical chipper. Chips shall not include

twigs, chopped leaves, or pine needles. Suitability of chip material and size will be determined by visual inspection by the ENGINEER. All wood chips shall be produced from trees free of any insects and diseases.

C. Shredded Bark

Shredded bark shall consist of tree bark which has been stripped and shredded from saw logs by means of a debarking machine. All shredded bark shall be produced from trees free of any insect and diseases. The material shall be sufficiently fine and free from extraneous material so that it will readily pass through a conventional mulch blower.

D. Double Shredded Bark

Double processed shredded bark mulch shall be shredded bark mulch which has been processed twice.

2.03 Topsoil

Topsoil shall be fertile, friable, sandy clay loam without admixture of subsoil. Topsoil is to be free of glass, stones greater than one (1) inch (25 mm) in any dimension, weeds, undesirable grasses and other extraneous materials. Topsoil shall have the following range of values:

- pH 5.0 to 7.5
 - soluble salts 500 ppm max
 - organic content 5% to 30%
 - silt content 35% to 50%
 - clay content 5% to 10%
 - deleterious mat'l* 5% max
- *rock, gravel, stone, sticks, roots, sod, etc.

Compost may be mixed with topsoil to obtain the desired content. Topsoil is to be final screened thru a 5/8-inch (15 mm) maximum mesh screen prior to delivery to the Project site. ENGINEER shall review source and final screen results prior to release of topsoil. CONTRACTOR shall submit a certified analysis of the topsoil from each source to the ENGINEER. Topsoil shall be placed in 4-inch (100 mm) minimum thickness throughout, or as specified in the plans or Specifications.

The CONTRACTOR shall obtain his own topsoil borrow pit source and shall obtain all necessary

permits and agreements for the use of such borrow pits at his own expense.

2.04 Sand

Sand for planting mixture shall be clean, course, ungraded sand conforming to ASTM C3 for fine aggregates.

2.05 Fertilizer

Fertilizer shall be Agriform 21-Gram Planting Tablets Plus Minors or ENGINEER approved equal. Planting Tablets shall be tightly compressed, long-lasting and slow-release with an N-P-K analysis of 20-10-5. Apply at manufacturer's recommendations and soil analysis.

2.06 Peat

Granulated raw Canadian peat or baled Canadian peat, containing not more than 9% mineral on a dry basis. For ericaceous plants, baled peat with a pH of 4.0 shall be used.

2.07 Landscape Weed Control Fabric

Weed barrier fabric shall consist of a geotextile fabric, spun-bonded polypropylene, non-woven fabric and a UV stabilizer.

(Minimum average roll values)

Fabric Properties	Minimum Values	Test Method
Unit Weight	3.0 oz/yd ²	ASTM D5261
Grab Tensile Strength	135 lbs.	ASTM D4632
Elongation at Break	70%	ASTM D4632
Puncture Strength	35 lbs.	ASTM D4833
Trapezoidal Tear	50 lbs.	ASTM D4533
Permittivity	1.2 sec.-1	ASTM D4491
Air Opening Size (equivalent Sieve)	60/70	ASTM D4751
Ultraviolet Stability	70% @ 500 hrs.	ASTM D4355

Fabric shall be Tyvar Professional Landscape Fabric 3301 or ENGINEER approved equal.

2.08 Steel Landscape Edging

Comply with ASTM A36 or A283, hot-rolled, standard flexible carbon steel landscape edging, fabricated in sections with stake pockets stamped, punched, or welded to face of sections approximately thirty inches (30") apart to receive stakes. Steel landscape edging shall be double staked at overlap joints, and designed to receive tapered steel stakes.

Steel Edge shall be 12ga (.10"-105") x 4" wide, by 10' length, with 4 stakes. Painted finish shall be Sherwin Williams H68GT85 powder coat paint electrostatically applied and oven baked. Minimum thickness to be 1.5 mils. Color shall be green, brown, or black as determined by the OWNER.

Steel stakes shall be Steel, tapered, 14" length and finished to match specified steel landscape edging. Stakes shall be designed specifically to anchor steel landscape edging in place, and made by the manufacturer of the steel landscape edging for which they will be used.

Furnish and install manufacturer's standard start/end sections, 90° corners, and splicers as required.

2.09 Stakes for Guying and Bracing

Stakes used for bracing or guying plants shall be sound wood of nominal 2" x 2" (50 mm x 50 mm) stock and shall be approximately 30 inches (750 mm) in length for guying or of the required length for bracing. The stakes shall be pointed on one end by beveling on two (2) sides.

Metal stakes for bracing trees shall be green metal T-section posts with no anchor plates. Posts shall be at least 8 feet (2.5 m) long. Posts shall only be used where specified on the plans.

2.10 Wire for Guying and Bracing

All wire shall be new and free from bends or kinks.

Wire used for guying trees four (4) inches (100 mm) or less in diameter shall be No. 11 steel wire.

Wire used for guying trees over four (4) inches (100 mm) in diameter shall be No. 9 galvanized steel wire.

2.11 Hose

Hose used with wire for guying trees shall be new
1/2-inch (10 mm) reinforced rubber garden hose or steam hose.

2.12 Plastic Guying and Bracing Material

High density polyethylene, chain-lock type material, 1-inch (25 mm) wide with a breaking strength of 100 lbs minimum.

Flat, woven, webbing type 3/4-inch (20 mm) wide tape constructed of polypropylene with a breaking strength of 900 lbs in either white or olive green.

2.13 Tree Balling Burlap

Balling material shall be untreated burlap or other material which will readily decompose. Synthetic materials such as nylon or plastic will not be permitted.

2.14 Planting Mixture

Planting mixture shall be a mixture of 1/3 topsoil, 1/3 sand, and 1/3 peat. Add fertilizer at the quantity as recommended by the manufacturer. Planting mixture shall be free from stick, stones, sod clods or other material which might leave pockets around the roots.

2.15 Bioretention Planting Mixture

Bioretention planting mixture shall have a sandy loam, loamy sand, or loam texture per USDA textural triangle. Maximum clay content shall be >5%. The soil mixture shall have a pH between 5.5 and 6.5 and an organic content of 1.5 – 3.0%. The soil mixture shall have an infiltration rate greater than 0.5 in/hr. The soil shall be a uniform mix, free of stones, glass, trunks, roots, or other similar objects larger

than 1-inch. No other material or substances shall be mixed or dumped with the bioretention mix that may be harmful to plant growth, or prove a hindrance to the planting or maintenance operations. The planting mixture shall be free of Bermuda Grass, Quack grass, Johnson Grass, Mugwort, Nutsedge, Poison Ivy, Canadian Thistle, Tearhub, or other noxious weeds.

2.16 Acceptable Manufacturers

Plastic guying and bracing material shall be Adj-A-Tye heavy duty poly chain lock by A. M. Leonard Inc., ArborTape by Neptco Inc. or ENGINEER approved equal.

Part 3 Execution

3.01 Contractor's Verification

The CONTRACTOR shall stake all plant locations and confirm the locations and type of plants to be placed with the ENGINEER. Inspect trees, shrubs and ground cover for injury, insect infestation and improper pruning. Verify that all trees, shrubs, and ground cover are in healthy growing condition.

3.02 Preparation

The CONTRACTOR shall not begin excavation until stake out of tree and/or shrub locations are acceptable to the ENGINEER.

The CONTRACTOR shall stake enough planting locations for two weeks work. The CONTRACTOR shall arrange periodic site meetings with the ENGINEER for the purpose of reviewing the work that has taken place in the prior two weeks and the staking for the next two weeks. The CONTRACTOR shall notify the ENGINEER at least three working days prior to the desired date for inspection of staking.

The CONTRACTOR shall accurately stake plant material location according to the plans. Stakes for trees shall be 36" high above finished grade and painted a bright color to be clearly visible for inspection. Distinguish by color between types of material, i.e., evergreen trees, canopy trees, flowering trees. Staking for shrubs,

perennials, and ground covers shall be staked 18" high above finished grade and painted white. Stakes shall be placed at the perimeter and at the bed line 30 feet on center. The ENGINEER shall review the locations and make changes in locations as necessary.

3.03 Planting

Balled and burlapped plants shall be set plumb. Tree pits shall be excavated as shown on the plans. The CONTRACTOR shall dispose of subsoil dug from pits, trenches and beds. The CONTRACTOR is responsible for planting to correct grades and alignment and all plants shall be set so that, when settled, they will bear the same relation to finish grade as they did before being transplanted. No filling will be permitted around trunks or stems.

At the start of the Work tree pits and beds are to be excavated and the CONTRACTOR shall request inspection and approval by ENGINEER. Approval must be received before backfilling occurs.

The root ball shall be set on a compacted base as detailed. Burlap shall be cut away from top 1/3 of the root ball and all ropes, wires, etc. securing the ball shall be removed.

All plastic tape and/or plastic fabric shall be completely removed from the root ball during the planting operation. "Rot proof" or treated burlap shall also be totally removed.

Container-grown plants shall be planted as specified for balled and burlapped stock, except that when plants are furnished in nonplantable containers, the container shall be removed only at the time of planting. Plants furnished in plantable type containers shall have container sides severed in multiple places and the upper half of the container removed during the planting operation. Care shall be taken to protect tree roots during severing and removal operation.

When the plant has been properly set, the pit shall be backfilled with planting mixture, gradually filling, tamping and settling with water. No soil in a frozen or muddy condition shall be used for backfilling. The backfill shall

be placed to an elevation flush with the ground elevation and the rootball, except that a saucer shall be created near the edge of the hole to capture water.

During fall planting, an ENGINEER approved superphosphate fertilizer shall be applied over the planting mixture at a rate per the manufacturer's instructions.

All evergreen plant material shall be sprayed with an ENGINEER approved anti-desiccant according to manufacturer's instructions and limitations immediately following planting and during final seasonal watering.

3.04 Mulching

After backfilling is completed, mulching material shall be placed over the plant hole area to a depth of five (5) to six (6) inches (125 - 150 mm) or as specified on the plans. Thoroughly soak all mulched areas. After watering, all mulched areas shall be raked and left in a complete and finished manner.

Perennial areas shall have 3 inches (75 mm) of mulch or as specified on the plans. Mulch these areas first and then plant ground cover through the mulch.

All planting beds shall be mulched with a 4 inch (100 mm) cover of mulch as shown on the drawings and details, unless otherwise indicated on the drawings. Mulch depths shall be 4 inches (100 mm) at time of inspection.

For plants located on slopes, an earth saucer or berm shall be constructed halfway around each plant on the down slope side. The saucer or berm shall have an inside diameter equal to that of the planting hole, and a maximum height of six (6) inches (150 mm). A trench shall be dug on the down slope side and filled with planting mixture to allow for drainage.

3.05 Bracing and Guying

Only evergreen trees equal to or larger than 5-foot (1.5 m) high and deciduous trees with a caliper equal to or larger than 2-inches (50 mm) need to be staked or guyed unless clay soil conditions exist, a tree is planted on a steep

slope, or otherwise becomes apparent that a tree needs to be braced or guyed. Trees required to be braced, shall be braced or guyed immediately after planting. All plants required to be braced shall be braced with a minimum of two (2) stakes. Stakes shall be driven to avoid ball and shall be no closer than 1-foot (300 mm) from the trunk. Stakes shall be driven to a depth which will firmly anchor the plant, but in no case less than 12 inches (300 mm) below the bottom of the planting hole. The wide side of the stake shall face the trunk of the plant. Stakes shall extend to within four (4) inches (100 mm) of the lowest plant's main branches. Top of stake shall be firmly attached to the trunk with steel wire or plastic guying and bracing material.

When using steel wire, place wire so it forms a figure eight (8) around the stake and trunk. Portions of wire around trunk shall be encased in water hose of sufficient length to contain the wire loop around the trunk. Enclosed trunk loops shall not restrict normal trunk growth. Stakes shall be positioned on opposite sides of trunks and secured to the trunk at approximately 2/3 the height of plant. Warning tape or ribbon shall be tied to the wiring between the tree and the stake.

3.06 Pruning

Where determined by the ENGINEER, pruning will be required. All pruning of the new plants shall be done by workmen experienced in this type of Work. Pruning shall be completed prior to planting. Hedge shears shall not be permitted for pruning. Pruning shall be done in accordance with the best standard practices. Deciduous trees shall have branches pruned to balance the loss of roots in such a manner as to retain the natural form of the tree type. Evergreen trees shall be pruned only to the extent of removing broken or damaged branches. All cuts shall be made flush, leaving no stubs. Paint all cuts over 3/4" (20 mm) in diameter with tree paint. Notify the ENGINEER at least one (1) week prior to pruning operations.

3.07 Watering, Fertilizing and Cultivating

All plants shall be thoroughly soaked after planting. After all watering, all beds shall be

raked and left in a complete and finished manner.

Watering, Fertilizing and Cultivating is required during the Establishment Period. Watering, Fertilizing and Cultivating shall include all measures necessary to establish and maintain plants in a vigorous and healthy growing condition for the entire Establishment Period.

The CONTRACTOR shall manually water the plants a minimum of once a week or as necessary to keep the plant in a thriving condition from May 15 until October 15 or for the duration of the Establishment Period.

If the planted areas have an automatic irrigation system that the CONTRACTOR is relying upon, it is the responsibility of the CONTRACTOR to ensure that the irrigation system is running properly. If the CONTRACTOR concludes that at any time the irrigation system is not working properly, then they shall notify the ENGINEER or the OWNER so that it may be fixed in a timely manner. However, the CONTRACTOR will have to manually water the plants as necessary to keep them in a thriving condition at all times that the irrigation system is not working properly.

Keep planting beds and tree saucers free from weeds to the satisfaction of the OWNER. Treat mulch with pre-emergent weed killer.

Keep trees erect. Raise trees that settle below grade to the established elevation. Keep tree wrap and wire in neat condition. Prune dead or broken branches from all trees and shrubs. Fill to the original grade level areas that have settled around trees and shrubs.

Winter protection shall include late fall spraying of all evergreen trees and evergreen shrubs with anti-desiccant, emulsion type agent, at the manufacturer's recommended rate to prevent winter desiccation and late fall watering if required by a dry season.

At the seasons first watering, an ENGINEER approved organic timed release, balanced fertilizer shall be applied to the ground around

the tree at the rate instructed by the manufacturer. In lieu of organic fertilizer, pre-packaged, controlled release fertilizer packets may be used. Use one (1) 2-ounce packet of fertilizer per every inch (25 mm) caliper of tree, or one (1) 2-ounce packet for every shrub.

During the first and second watering of the growing seasons, the water used for each plant shall be a nitrogen-enriched solution containing available nitrogen at the rate of 8.3 pounds per 1,000 gallons (1 kg/kl) of water (42 pounds of 20-0-0, or 18 pounds of 45-0-0, fertilizer per 1,000 gallons of water). No fertilizer shall be applied after July 7.

During the establishment period(s) as called for in the Contract Documents, the CONTRACTOR shall do all required watering, cultivating, pruning, fertilizing, weeding, and all other work necessary to keep the planted material vigorously growing sound and healthy. The CONTRACTOR shall repair or replace any guying or bracing which is damaged, destroyed, or broken. The CONTRACTOR shall spray any plant material which becomes diseased or infested with insects.

The CONTRACTOR shall repair or replace any trees which are blown over, knocked down, uprooted or otherwise become impaired or defective. The CONTRACTOR shall replace any plant material which is not in good physical condition, has more than 20% die back, shows defective growth, disease, signs of insect infestation, or any other signs of impairing defects during the Establishment Periods.

The CONTRACTOR shall repair or replace any plant material damaged or impaired by wind, rain, snow, ice, sleet, sun, heat, drought, or any other weather related occurrences. The costs for all labor, material, and equipment necessary to carry out the provisions of this Article shall be included in the CONTRACTOR's bid price for the planting of trees unless otherwise indicated in the Proposal. The CONTRACTOR shall notify the ENGINEER prior to beginning any work called for under this Article.

At the end of the Establishment Period, unless otherwise determined by the ENGINEER, the guying material, wrapping material,

identification tags, and inspection tags shall be removed and disposed of off the project and the mulch around all the plants shall be replenished to the required depth of five to six inches (125 - 150 mm).

3.08 Establishment Period

The Establishment Period shall begin on the day of written acceptance of the installation of the trees, shrubs, bulbs, ground cover or other plant material. Each subsequent establishment period shall begin on the same day of the succeeding year(s). The Establishment Period shall be a minimum of one year unless otherwise indicated in the Contract Documents.

3.09 Schedules

The general planting location, type and size of tree or shrub shall be as indicated on the Plans. Any substitutions of plant material or alteration in plant sizes or specifications shall be approved by the ENGINEER prior to ordering.

3.10 Steel Landscape Edging

Install steel landscape edging where indicated on Drawings, according to manufacturer's recommendations. Anchor with steel stakes spaced approximately 30 inches on-center, driven below top elevation of edging, or at every stake pocket location in landscape edging sections designed and manufactured to receive stakes. Stakes shall be located in solid undisturbed soil, or in soil compacted to 85% of its maximum density.

Install straight sections true to the alignments as indicated, free of waves or bends, using strings as guides. Install curved sections true to the alignments as indicated, free of waves or bends, following marked alignments approved in the field by the ENGINEER. ENGINEER shall be given the opportunity to review the layouts. Set top of edging flush with finish grade. Set top of stake ½-inch below top of edging.

Replace edging sections damaged by construction operations.

End of Section

Section 32 9113

Imported Compost for Landscaped Areas

Part 1 General

1.01 Summary

- A. The work specified herein shall consist of incorporating compost within the root zone in order to improve soil quality and plant growth.

1.02 Related Work Specified Elsewhere

- A. Section 01 3300: Submittal Procedures
- B. Section 32 9000: Plantings
- C. Section 32 9220: Native Seeding

1.03 Reference Standards

- A. ANLA - American Nursery & Landscape Association
- B. ANSI - American National Standard Institute
- C. ASTM - American Society for Testing and Materials (ASTM) International

1.04 Material Description

- A. General:
 - 1. Compost shall be well decomposed, stable, weed free organic matter source. It shall be derived from agriculture, food, or industrial residuals; biosolids, yard trimmings; source separated or mixed solid waste.
 - 2. Compost shall contain no substances toxic to plants and shall be reasonable free (<1% by dry weight) of man-made foreign matter.
 - 3. Compost will possess no objectionable odors and shall not resemble the raw material from which it was derived.
 - 4. Composts containing available nutrients, primarily nitrogen, are preferred, while the use of unstable or immature compost is not approved.
- B. Product Parameters:
 - 1. Compost shall be in accordance with the parameters outlined in Section 32 9200 Plantings.

1.05 Quality Assurance

- A. Certifications from Supplier to conformance with Material requirements. Before delivery of the compost, the Supplier must provide a copy of a lab analysis, performed by product parameters listed in Table 1.

TABLE 1		
Parameters	Reported as Unit of Measure	General Range
pH	pH Units	Below MDEQ Part 201 Cleanup Criteria or as approved by the Professional
Soluble Salt Concentrations	dS/m	
Moisture Content	% wet weight basis	
Organic Matter Content	% dry weight basis	
Particle Size	% passing a selected mesh size, dry weight basis	
Physical Contaminants	% dry weight basis	
Chemical Contaminants	Mg/kg (ppm)	

1.06 Delivery, Storage and Handling

- A. Compost shall be mixed according to the wetland soil design mix or landscaped area soil mix prior to delivery to the site.
- B. Compost mix shall be stored and covered until placed on site.

1.07 Sequencing

- A. Coordinate work of other trades specified elsewhere.
- B. Do not perform soil preparation work in areas subject to the subsequent work of other sections, unless approved otherwise.

1.08 Scheduling

- A. Perform all work in accordance with the approved schedule.

Part 2 Products

2.01 Materials

- A. Compost shall meet the requirements of Article 1.05 of this Section.
- B. Submit one (1) gallon sample, source and letter of certification from the Supplier to the Owner and the Engineer for approval prior to installation.

End of Section

Section 32 9219 Seeding

Part 1 General

1.01 Scope

This Section includes seeding complete with earth bed preparation, providing and placing topsoil, preparation and fertilizing topsoil, sowing of seed for lawns and other ground cover, protection of seeded areas, watering of seeded areas, mowing of seeded areas, protection and cleanup.

1.02 Related Work Specified Elsewhere

1. Unit Prices: Section 01 2200
2. Site Construction Preparation Requirements: Section 01 8900
3. Grading: Section 31 2200
4. Sodding: Section 32 9223

1.03 Requirements of Regulatory Agencies

Comply with the applicable requirements of the Michigan Department of Agriculture, Pesticide and Plant Pest Management Division, Michigan Seed Law, Act 329, PA of 1965, as amended.

Comply with the applicable requirements of the Proceedings of the Association of Official Seed Analysts, Rules for Testing Seeds.

Chemical fertilizer shall be supplied in suitable bags with the net weight of the contents and guaranteed analysis shown on the container. Bulk shipments shall be accompanied by an analysis and net weight certification of the shipment. Custom mixed fertilizers shall be accompanied by a certification of the weight of each commercial fertilizer used in the mixture and a guaranteed analysis of each shipment expressed in percentages of total Nitrogen (N), total available Phosphoric Acid (P_2O_5) and total available Potash (K_2O) included.

1.04 Source Quality Control

A seed mixture proposed for use in the Work shall have been tested for purity and germination by the Seed Producer within nine (9) months of sowing.

1.05 Reference Standards

ASTM- American Society for Testing and Materials

MDOT- Michigan Department of Transportation, Standard Specifications for Construction, latest edition

1.06 Submittals

Submit Seed Producers Certification that seed meets the requirements of these Specifications and conform to the State of Michigan Seed Act referenced above under Article 1.03 of this Section.

Where required, submit test reports for all seed proposed for use in the Work to the ENGINEER, showing results of purity and germination tests, compliance with regulatory agencies, dates and location of tests.

1.07 Product Delivery, Storage, and Handling

All material shall be delivered to the Project site in their original, unopened containers. Containers shall be clearly marked showing, name of manufacturer, brand name, trade name or generic name of material, warranty of analysis, net weight of contents and date of packaging, where applicable.

Seed shall be delivered to the site in durable bags, tagged or labeled to show date of tests, warranty of purity and germination analysis, name, lot number and net weight of contents.

Commercial fertilizers shall be delivered to the site of the Work in the original unopened bags. Bags shall not exceed 100 pounds (45 kg) net weight each and shall be clearly marked with guaranteed analysis in a conspicuous location on each bag.

Material shall be stored at the Project site, under shelter, off the ground and shall be protected from

damage by moisture, temperature, exposure to elements, vandalism or other action which might otherwise impair their use.

All materials proposed for use in the Work shall be handled in a manner that will protect the material and the personnel involved in the Work. Handle seed in a manner which will protect the mixture from contamination or deterioration.

1.08 Environmental Requirements

Seeding is limited to the periods between April 20 and June 1, August 10 to October 1 and after November 20 for as long as weather permits preparation of the seed bed without irrigation and/or mulch. With the use of irrigation and/or mulch, seeding can be done from April 20 thru October 1 inclusively.

Comply with the limitations placed on the use of certain soil protection materials because of prevailing temperatures as described in this Section.

Comply with the limitation placed on seeding applications because of wind velocity as described in this Section.

1.09 Protection

Provide suitably approved warning signs and barricades for protection of seeded areas from pedestrian or vehicular traffic. Protect all newly seeded areas during the progress of the Work and until completion of the turf establishment period.

Protect all adjacent construction from topsoil spills and perform such cleanup of affected surfaces before it becomes compacted by traffic.

1.10 Final Acceptance

The CONTRACTOR shall establish a dense cover of seeded grass on all disturbed areas. These areas shall be maintained until final acceptance of the Work by the ENGINEER. The ENGINEER will inspect the turf to insure that the grass seed is well established, weed free, in a growing and vigorous condition. Areas that do not meet the approval of the ENGINEER shall be re-seeded at the CONTRACTOR's expense.

Part 2 Products

2.01 Seed

Seed and seeding mixtures shall be certified, mature, clean, dry, new crop seed products suitable for the specified applications and having the percentages of purity, germination and proportions, by weight, indicated in Table 1.

TABLE 1 - SEEDING MIXTURES

Kind	Seeds		Mixture Proportions (%)			
	Pur-ity	Germination	TDS	TUF	TGM	THM
Kentucky Blue Grass	98%	80%	5	10	10	30
Perennial Rye Grass	96%	85%	25	20	20	20
Hard Fescue	97%	85%	25	20	30	
Creeping Red Fescue	97%	85%	45	40	40	50
Fults Salt Grass	98%	85%*		10		

TABLE 2 – SOIL TYPES AND LOCATION OF SEEDING

Symbol for Turf Seed Mixture	Soil Type	General Location	Rate of Seeding lbs/ac (kg/ha)
TDS	Dry Sandy to Sand Loam	Rural or Urban	250 (280)
TUF	All Types	Urban Freeway, Blvds, City Streets	250 (280)
TGM	Medium to Heavy	All	250 (280)
THM	Loamy to Heavy	Home and Business Turf	250 (280)

The specific mixture to be used shall be for the type of soil on the Project and the location of the seeding unless otherwise indicated on the Plans or as designated by the ENGINEER.

Hydroseeding shall consist of a blend of seed, fertilizer and hydromulch.

2.02 Mulching Material

A. Straw

Small grain straw or grass or marsh hay acceptable to the ENGINEER.

B. Wood Excelsior

Green wood fibers, baled or blanket of type and manufacture acceptable to the ENGINEER.

Wood excelsior shall be made of green timber fiber baled so that the bales weigh 80 to 90 pounds at the time of manufacture.

Wood excelsior blankets shall be made of a uniform web of interlocking fibers with a backing of fabric netting on one (1) side only. The fabric net shall have a mesh size not exceeding 1-1/2" x 3" (40 mm x 75 mm) and shall be a woven of either cotton cord, twisted paper cord or a synthetic, biodegradable fiber. Blankets shall be produced in the form of a tightly compressed roll 36 inches ± 1-inch (900m m ± 25 mm) wide and approximately 120 feet (36 m) long. Blanket shall have a fiber net on the outside of the fiber mat. Blanket roll weight, when manufactured, shall average 85 pounds (38 kg) ± 10%. Each roll shall have separator sheets of 40 pound Kraft paper placed at the beginning and at the end of each roll to facilitate unrolling and handling at the job site. The Kraft paper sheet at the end of each roll shall also form a wrapper for the roll.

C. Netting

Twisted Kraft paper or synthetic fiber, biodegradable woven mesh net material suitable for the application and acceptable to the ENGINEER.

The net shall consist of a biodegradable mesh with openings not to exceed 1-1/2" x 3" (40 x 75 mm)

The net shall be furnished in widths of not less than 35 inches (900 mm).

D. Proprietary Mulch Material

Biodegradable natural and/or synthetic materials suitably fabricated and acceptable to the ENGINEER.

2.03 Mulch Anchoring Material

A. Emulsified Asphalt

ASTM D977, Rapid Setting (R.S. 1 or 2), Medium Setting (M.S. 2 or 2h) or Slow Setting (S.S. 1).

B. Mulch Anchoring Tool

Suitable unit having a series of flat, notched discs for punching and anchoring mulch in soil, or a regular farm disc weighted and set nearly straight as a substitute.

C. Latex Base Adhesive

Latex base adhesive mixed with water at a ratio of 25 gallon of water to 1 gallon adhesive with 25 pounds of recycled newsprint as a tracer (14 L of adhesive with 0.35 kL of water with 28 kg of newsprint).

D. Recycled Newsprint

Mix 7 pounds of newsprint with 7 gallons of water (60 kg of newsprint with 1000 L of water).

E. Guar Gum

Mix 1 pound of dry adhesive with 26.5 gallons of water with 5 pounds of recycled newsprint as a tracer (55 kg adhesive / 12 200 L water / 280 kg newsprint).

2.04 Fertilizer

Fertilizer shall be a standard commercial grade fertilizer, conforming to state regulations, of the type recommended for grasses. The fertilizer shall contain slow release nitrogen amounting to 75% of the nitrogen available. Fertilizer shall be uniform in composition, free flowing and suitable for application with method selected. Fertilizer for hydraulic seeding shall be soluble or ground to a fineness that will permit complete suspension of all insoluble particles in the slurry.

2.05 Agricultural Liming Materials

Burnt lime (quick lime), hydrated lime, limestone (calcite and dolomite), marble shells and by-products shall conform to the requirements of ASTM C602.

2.06 Water

Free of matter harmful to plant growth.

2.07 Staples

Wire staples for holding mulching materials in place shall be not less than six (6) inches (150 mm) long No. 11 (U.S. Steel Gage) steel wire or longer.

2.08 Topsoil

Topsoil shall be fertile, friable, sandy clay loam without admixture of subsoil. Topsoil is to be free of glass, stones greater than one (1) inch (25 mm) in any dimension, weeds, undesirable grasses and other extraneous materials. Topsoil shall have the following range of values:

Quality Parameter	Range of Value
Soil pH	5.0 to 7.5
Soluble Salts	500 ppm max
organic content	5 to 30 %
silt content	35% to 50%
clay content	5% to 10%
deleterious mat'l*	5% max

*rock, gravel, stone, sticks, roots, sod, etc.

Compost may be mixed with topsoil to obtain the desired content. Topsoil is to be final screened thru a 5/8-inch (15 mm) maximum mesh screen prior to delivery to the Project site. ENGINEER shall review source and final screen results prior to release of topsoil. CONTRACTOR shall submit a certified analysis of the topsoil from each source to the ENGINEER. Topsoil shall be placed in 3-inch (75 mm) minimum thickness throughout, or as specified in the plans or Specifications.

The CONTRACTOR shall obtain his own topsoil borrow pit source and shall obtain all necessary permits and agreements for the use of such borrow pits at his own expense.

2.09 Improved Topsoil

Improved topsoil shall consist of a mixture of 2/3 topsoil and 1/3 compost. Compost shall be mature/stabilized, humus-like material derived from the aerobic decomposition of yard waste (i.e., grass clippings and leaves) or other materials as designated compostable as defined in P.A. 641 as amended and shall be in compliance with all federal and state laws. The improved topsoil mixture shall have a dark brown or black color, be capable of supporting plant growth without

ongoing addition of fertilizers or other soil amendments and shall not have objectionable odor.

The mixture shall be free of glass, plastic, metal, and other contaminants, as well as viable weed seeds and other plant parts capable of reproducing.

The mixture shall be such that no visible water or dust is produced when handling it.

The manufacturer of the compost shall maintain annually on file with the Michigan Department of Agriculture, Pesticide and Plant Pest Management Division, test data and a statement to show that the following criteria are being met by the compost provided for the project.

1. The composition of the compost shall be within the following range of values

Quality Parameter	Range of Value
Soil pH	6 to 7.5
Soluble Salts	2 to 5 mmho/cm
Carbon/Nitrogen Ratio	13 to 20 parts Carbon to 1 part Nitrogen
Inerts	< 1%
Organic matter	35 to 55 %
Nitrogen	1 to 2 %
Phosphorus	0.2 to 0.8 %
Potassium	0.5 to 1.5 %
Unit Weight	535 to 775 Kg/m ³
Moisture Content	40 to 50 %
Particle Size	< 20 mm maximum
Water Holding Capacity	> 100%
Heavy Metals	None

2. Maturity/Stabilization – An acceptable test that can demonstrate Maturity/Stability.
3. Temperature – The compost material must have undergone the procedure to significantly reduce the pathogen level as referenced in EPA 40 CFR, Part 257 Regulations, Federal Register Vol. 58, No. 32, dated 2/19/93; Rules and Regulations. The temperature must be maintained at 40° C for 5 days with a temperature exceeding 55° C for at least 4 hours.
4. Pathogens and Trace Elements – Shall meet the requirements of EPA 40 CFR; Part 503 Regulations, Federal Register Vol. 58, No. 32, dated 2/19/93; Rules and Regulations.

To comply with the annual filing requirements with the Michigan Department of Agriculture, Pesticide and Plant Management Division, the supplier of the compost shall certify that the compost meets Michigan P.A. 641 as amended and EPA 40 CFR, Part 257 and 503 Regulations, Federal Register Vol. 58, No. 32; dated 2/19/93; Rules and Regulations.

A data sheet shall accompany the certification.

The data sheet shall show the following:

- Standard compost total nutrient test results, including N, P, K, Ca, Mg, Mn, Cu, Fe total carbon, pH, as provided by an acceptable testing laboratory
- Organic content
- Inert contamination
- Soluble salts
- Carbon/Nitrogen ratio
- Proof of maturity/stability acceptable to the Michigan Department of Agriculture

The certification and data sheets shall be mailed annually to the Michigan Department of Agriculture, Agriculture Environment Coordinator. The date shall be included on which the compost test results were mailed to the Michigan Department of Agriculture.

Part 3 Execution

3.01 Preparation of Subgrade

Complete all fine grading within the areas to be covered with topsoil necessary to bring the surface of the proposed subgrade to the elevations indicated on the Plans and parallel to the proposed finished grade. The surface of the subgrade immediately prior to being covered with topsoil shall be raked or otherwise loosened to a minimum depth of two (2) inches (50 mm) to facilitate making a bond between the subsoil and the topsoil.

3.02 Preparation of Soil

After the areas to be seeded have been brought to the required grade and properly trimmed and cleaned up, the existing soil shall be brought to a friable condition by harrowing or otherwise

loosening and mixing to a depth of at least four (4) inches (100 mm). All lumps and clods shall be thoroughly broken. When the area to be seeded has been prepared and covered with a layer of topsoil as specified under Article 3.01 of this section, this operation will not be required.

3.03 Preparation of Mulch Material

When seed is to be sown through mulch which has been in place for a period of more than two (2) weeks or which is being held in place by a surface-applied coating of asphalt emulsion or other adhesive, the mulched area shall be prepared for seeding by discing, a spike-toothed harrow, or by other means acceptable to the ENGINEER.

3.04 Placing and Spreading Topsoil

Topsoil shall be placed and spread over the area designated on the Plans, or as determined by the ENGINEER, to a depth of four (4) inches, \pm 1-inch (100 mm \pm 25 mm) or to such depth as specified on the plans. In all cases, topsoil shall be placed to a depth sufficiently greater than that shown on the Plans or specified so that, after natural settlement or rolling, the completed Work will conform to the lines, grades and elevations shown on the Plans. Spreading of topsoil shall be completed in such a manner that seeding as specified can proceed without additional moving of topsoil. Topsoil furnished and placed shall be considered incidental to seeding unless otherwise specified in the Proposal.

After topsoil is spread, all large earth lumps, rocks, roots, debris, or other foreign matter shall be raked and removed from the topsoiled area and legally disposed of by the CONTRACTOR.

3.05 Fertilizing

Chemical fertilizer shall be applied on the prepared soil surfaces at a minimum rate of 1/3 ton per acre (666 lbs/ac.) (750 kg/ha) of 12-12-12 fertilizer, or such other rate of another fertilizer mixture that yield 240 lbs/acre (270 kg/ha) of nutrient. Dry fertilizers shall be thoroughly disced, harrowed or raked into the soil to a minimum depth of not less than 1-inch (25 mm). Where hydraulic seeders are used for sowing seed, one half the recommended rate of fertilizer may be spread in combination with such sowing with the

balance incorporated into the soil prior to seeding. In all other cases, fertilizer shall be incorporated into the soil before any seeding is started.

3.06 Seeding

Seed of the kind required shall be sown at the rate as specified in Table 2. Seed shall be sown in the presence of an inspector by mechanical spreader, hydraulic seeder or broadcasting. The broadcasting method shall be used for sowing seed only in areas inaccessible to mechanical spreading equipment. Seeding during winds above 15 miles per hour (25 km/hr) shall not be permitted.

Prior to placing seed materials, water topsoil to a depth of four (4) inches (100 mm) at least 48 hours prior to seeding operations to obtain a loose friable seed bed. Time and depth of watering operations shall be varied at the direction of the ENGINEER for varying conditions at the site of the Work.

Broadcasting methods for sowing seed materials shall be accomplished by spreading one-half of the specified amount of seed in one direction and then broadcasting the remaining one-half of the seed at right angles to the first seeding pattern using the same broadcast method. Rate of broadcast shall be as specified herein or per the written recommendations of the Producer of the seed material used. Roll seeded area with roller weighing a maximum of 150 pounds/foot (225 kg/m) of width.

Hydroseeding shall be performed using suitably acceptable hydraulic seeding equipment and a homogeneous slurry solution of water, seed, fertilizer and suitable mulch material as approved by the ENGINEER. Seed slurry mixture shall be distributed uniformly at a rate approved by the ENGINEER for the seed materials, fertilizer and/or mulch materials used to suit the seed application rate. Seed application rate shall be 300 lbs/acre (340 kg/ha).

3.07 Mulching

Mulching shall consist of placing a mulch material on areas that have been or are to be seeded. Mulch shall be placed in a loose enough condition so as to allow penetration of sunlight and circulation of air, but thick enough to shade the ground, reduce rate of water evaporation and prevent or reduce erosion

by wind or water. Mulch shall be secured with suitably acceptable anchoring material.

For surfaces and slopes on which power equipment can be operated, satisfactory mulching materials include the following:

Small grain wheat straw or grass hay applied at 1-1/2 to two (2) tons per acre (3.5 to 4.5 metric ton/ha) with disc packer, asphalt or netting tie-down.

Wood chips applied at six (6) to nine (9) tons per acre (13.5 to 20.0 metric tons/ha).

Asphalt emulsion alone at 600 to 1,200 gallons per acre (5.5 to 11. kl/ha). (This application is suitable for limited periods of time and where trampling by either people or animals will not occur.)

For surfaces and slopes where power equipment cannot be operated, satisfactory mulching materials include the following:

Straw or grass hay applied at 1-1/2 to two (2) tons per acre (3.5 to 4.5 metric tons/ha), anchored with asphalt or netting tie-down.

Asphalt emulsion alone at 600 to 1,200 gallons per acre (5.5 to 11.0 kl/ha). (Limited to areas where tracking is not a problem.)

Commercially available erosion control netting of jute, paper or biodegradable synthetics.

Continuous filament fiberglass at 1,000 pounds per acre (1100 kg/ha) anchored with 150 gallons (1400 l/ha) of asphalt emulsion.

Anchor straw or hay mulch by the methods as specified herein.

Wood chips will not need anchoring when used on workable slopes.

Commercially manufactured netting and/or fiberglass materials shall be anchored in accordance with the manufacturer's printed instructions for the material used.

Punch and anchor mulch material into soil using mulch anchoring tool. Soil must be moist, free of stones and loose enough to permit disc penetration to a depth of three (3) inches (75 mm).

Blow on liquid or emulsified asphalt materials with the straw or hay mulch or spray or sprinkle asphalt tie-down materials immediately after mulch is spread.

Apply emulsified asphalt at 0.04 gallons per square yard (0.2 l/m²). Do not apply emulsified asphalt during freezing weather since it contains approximately 50% water. Apply liquid (cut back) asphalt at approximately 0.10 gallons per square yard (0.45 l/m²). Liquid asphalt may be applied during freezing weather since it is cut back with kerosene.

3.08 Conversion from Soil Protection to Permanent Vegetation

Following straw or hay mulching, grass seeding can be made in early spring by broadcasting seed directly into the mulch. Fertilizer or lime, where needed, should be incorporated into the soil before mulching.

Asphalt emulsion alone can be readily incorporated into the soil by ordinary tillage before seeding.

Wood chip mulch may be removed before seeding or incorporated deeply into the soil. If wood chips are incorporated into the soil, the addition of extra nitrogen fertilizer to the soil will be required to provide nitrogen in the new seeding.

Fiberglass mulch shall be removed before seeding because of its permanence. Care shall be taken to prevent fiberglass filaments left in place from becoming entwined or wound around shafts of power mowers or other power equipment.

Acceptable proprietary netting and erosion control materials shall be disposed of in accordance with the manufacturer's printed instructions for the material used prior to any seeding operations.

3.09 Turf Establishment

Seeded areas shall be watered whenever excessive drying is evident during the period set for establishment. Watering shall be done in a manner that will prevent erosion due to the application of excessive quantities and the watering equipment shall be of a type that will prevent damage to the cultivated surfaces. The CONTRACTOR shall be

responsible for the proper care of the seeded areas until final acceptance of the entire Work covered by the Contract.

The seeded areas shall be mowed with mowing equipment acceptable to the ENGINEER to a height of two (2) inches (50 mm) whenever the average height of grass establishment reaches four (4) inches (100 mm). When the amount of cut grass is heavy, cut grass shall be removed to prevent destruction of the underlying grass. If weeds or other undesirable vegetation threaten to smother the planted species, such vegetation shall be mowed, or in the case of rank growths, shall be uprooted, raked and legally disposed of from the area.

Reseed and mulch areas larger than four (4) square inches (25 cm²) not having a dense, uniform, vigorous stand of grass acceptable to the ENGINEER.

The establishment period shall extend for a period from the time of seeding until the seeded area has a uniform stand of grass acceptable to the ENGINEER. The minimum period shall be 30 days.

If after 60 days from the initial seeding a dense, uniform, vigorous stand of grass has not been established by the CONTRACTOR, the OWNER may reseed the defective areas and all costs will be deducted from the CONTRACTOR's payments.

End of Section

Section 32 9220 Native Seeding

Part 1 General

1.01 Scope of Work

- A. This Section includes seeding complete with earth bed preparation, providing and placing topsoil, preparation and fertilizing topsoil, sowing of seed for lawns and other ground cover, protection of seeded areas, watering of seeded areas, mowing of seeded areas, protection and cleanup.

1.02 Related Work Specified Elsewhere

- A. Section 01 2200: Unit Prices
- B. Section 01 8900: Site Construction Performance Requirements
- C. Section 31 1100: Grading
- D. Section 32 0190: Maintenance of Planted Area

1.03 Requirements of Regulatory Agencies

- A. Comply with the applicable requirements of the Michigan Department of Agriculture, Pesticide and Plant Pest Management Division, Michigan Seed Law, Act 329, PA of 1965, as amended.
- B. Comply with the applicable requirements of the Proceedings of the Association of Official Seed Analysts, Rules for Testing Seeds.
- C. Chemical fertilizer shall be supplied in suitable bags with the net weight of the contents and guaranteed analysis shown on the container. Bulk shipments shall be accompanied by an analysis and net weight certification of the shipment. Custom mixed fertilizers shall be accompanied by a certification of the weight of each commercial fertilizer used in the mixture and a guaranteed analysis of each shipment expressed in percentages of total Nitrogen (N), total available Phosphoric Acid (P₂O₅) and total available Potash (K₂O) included.

1.04 Submittals

- A. The following documentation shall be submitted in accordance with Section 01 3300, Submittal Procedures, for approval before any seeding is performed.
 - 1. CONTRACTOR shall submit a statement of his qualifications, including five (5) prior project summaries, similar in size and scope, with contact names and information, as well as the resumes of field installation personnel who will be working on the project.
 - 2. CONTRACTOR shall be responsible for verifying the availability of specified plant material for the appropriate planting season and construction schedule.
 - a. Within 15 days of Notice of Award, CONTRACTOR shall provide written verification on the availability of plant material.
 - 3. CONTRACTOR shall submit material data sheets on the materials specified herein prior to materials being brought on to the site, including:

- a. Certification of seed mixture(s) from Seed Producer or Seed Supplier, stating the botanical and common names of each species, composition by weight of each species; including the year of production and date of packaging.
 - b. Documentation of PLS (Pure Live Seed) testing from qualified independent testing laboratory for each species.
 - c. Product data sheets for all herbicides, erosion-control materials and nuisance species control products used on project.
- 4. CONTRACTOR shall submit documentation of amended soils, including percentages of amendments by weight and certification indicating that the amendments are free of noxious weed seeds.
 - 5. CONTRACTOR shall submit a planting schedule for all seeding prior to installation.

1.05 Quality Assurance

- D. A seed mixture proposed for use in the Work shall have been tested for purity and germination by the Seed Producer within nine (9) months of sowing.
- A. Work shall be performed by an installer specializing in native plant installations. Installer must have completed at least five (5) projects similar in size and scope within the past three (3) years.
- B. CONTRACTOR shall provide an on-site supervisor experienced in native planting with a minimum four (4) year degree in natural resources, biology, or related field. On-site supervisor must be on site at all times during seeding operations and will be familiar with equipment, techniques and materials being used.
- C. CONTRACTOR personnel performing chemical applications shall be licensed in accordance with all federal, state and local laws pertaining to the specific application being performed.
- D. Materials and practices used in this portion of work shall meet or exceed applicable federal, state, and local regulations. If these standards are not met, installer shall be responsible for any fees, reparations or liabilities.

1.06 Material Shipping, Handling and Storage

- A. Material shall be delivered to the Project site in their original, unopened containers. Containers shall be clearly marked showing, name of manufacturer, brand name, trade name or generic name of material, warranty of analysis, net weight of contents and date of packaging, where applicable.
- B. Seed shall be delivered to the site in durable bags, tagged or labeled to show date of tests, warranty of purity and germination analysis, name, lot number and net weight of contents. Retain all labels and/or containers in an on-site location, through Substantial Completion.
- C. Commercial fertilizers shall be delivered to the site of the Work in the original unopened bags. Bags shall not exceed 100 pounds (45 kg) net weight each and shall be clearly marked with guaranteed analysis in a conspicuous location on each bag.

- D. Materials shall be stored at the Project site, under shelter, off the ground and shall be protected from damage by moisture, temperature, exposure to elements, vandalism or other action which might otherwise impair their use. Seed shall be stored in a manner to protect from moisture, heat, or other conditions that would jeopardize viability or cause germination before installation.
- E. Materials proposed for use in the Work shall be handled in a manner that will protect the material and the personnel involved in the Work. Handle seed in a manner which will protect the mixture from contamination or deterioration.
- F. If seed blends are to be provided, seed shall be mixed prior to delivery by the supplier or CONTRACTOR.

1.07 Job Conditions

- A. Seeding is limited to the periods between April 20 and June 1, September 15 to October 1 and after November 20 for as long as weather permits preparation of the seed bed without irrigation and/or mulch. With the use of irrigation and/or mulch, seeding can be done from April 20 thru October 1 inclusively.
 - 1. Proceed with planting only when existing and forecasted weather conditions permit.
- B. Comply with the limitations placed on the use of certain soil protection materials because of prevailing temperatures as described in this Section.
- C. Comply with the limitation placed on seeding applications because of wind velocity as described-in this Section.

1.08 Protection

- A. Provide suitably approved warning signs and barricades for protection of seeded areas from pedestrian or vehicular traffic. Protect all newly seeded areas during the progress of the Work and until completion of the turf establishment period.
- B. Protect all adjacent construction from topsoil spills and perform such cleanup of affected surfaces before it becomes compacted by traffic.

1.09 Scheduling

- A. Methods of installation will vary according to the time of year:
 - 1. November 20 thru February 28:
 - a. Seed must be protected from displacement by water and wind erosion.
 - b. Seeding on bare, graded surfaces must be protected with appropriate erosion control blankets on slopes steeper than 5:1, and with blown and crimped straw mulch at 1½ tons per acre on lesser slopes.
 - c. Seed drilled into existing vegetation or on flat ground not subject to erosion may need only minimal erosion protection.
 - d. Seed cannot be sown when there is snow on the ground.
 - 2. March 1 thru June 1:

- a. Seeding during this period is appropriate but germination of a portion of the seed may not occur until the following season due to lack of cold stratification to break seed dormancy.
 - b. Blown and crimped straw mulch is recommended at 1½ tons per acre on bare soils.
 - c. Mulch may not be required if seed is drilled into existing vegetation or flat ground not subject to erosion.
 - d. Seed cannot be sown when there is snow on the ground.
3. June 2 thru September 14:
- a. Installation of native seed should be suspended unless irrigation can be provided. Seeding shall only occur during this time with approval from Engineer.
 - b. See irrigation guidelines specified herein.
 - c. Annual forbs planted with the mix during this time period may germinate but not have sufficient time to flower before fall senescence.
4. September 15 thru October 1:
- a. Seeding on graded, bare-soil surfaces must be protected with appropriate erosion control blankets on slopes steeper than 3:1, and with blown and crimped straw mulch at 1 ½ tons per acre on lesser slopes.
 - b. Seed drilled on flat ground not subject to erosion or into existing vegetation may not require erosion protection.

1.10 Performance Standards

- A. At least 90% of the seeded area shall be vegetated with native species or cover crop species from the seed mix by June 1 following seeding (if planting occurred from September 15 through February 28), or within 60 days of seeding if planted outside this period.
 - 1. Performance shall be verified by means of a walk-through inspection by CONTRACTOR with OWNER and ENGINEER, rather than by formal sampling.
- B. After one (1) full growing season at least 50% of the native species seeded must be present as live plants, and areal coverage of native species shall be at least 20%.
- C. After two (2) full growing seasons, areal coverage of native species shall be at least 60%.
- D. There should be no single area of bare ground greater than 225 sq. ft. (15' x 15').
- E. If the contract period extends past two (2) growing seasons, areal coverage of native species should be at least 80% after three (3) full growing seasons.
- F. Survival percentages shall be established by sampling of one square meter quadrats located at regular intervals along transects. The number of quadrats shall be as needed to sample a minimum of 0.2% of the total planting area in each planting zone, and there

shall be at least one randomly-located transect in each planting zone. The sampling plan shall be approved by ENGINEER after consultation with a restoration ecologist if necessary.

- G. If these standards are not met, CONTRACTOR should be responsible for supplemental seeding in accordance with the specifications and with input from a restoration ecologist if necessary. Losses due to animal depredation, extremes in weather or precipitation, or lack of water control should not be covered under this warranty.

Part 2 Products

2.01 Seed

- A. Sources:
 - 1. Native seed should be obtained from sources within the same EPA Level III Ecoregion as the project site.
 - 2. If the desired species are not available from the same Ecoregion, materials shall be obtained from an adjacent region, preferably to the west or east.
 - 3. No seed species shall originate from more than 300 miles of the project site.
- B. Seed supplied to the site shall be tagged with the botanical and common names, bulk weight, PLS weight, and documentation of PLS testing.
- C. Pure Live Seed: Seed quantities shall be provided on a PLS (pure live seed) basis. Bulk quantities used on the project will vary with the actual percent of PLS of the seed lot.
- D. Seed mix(es) shall be provided according to the species list below, proportioned by weight and applied at the specified rates:

- 1. Slope Stabilization Seed Mix:

Botanical Name	Common Name	PLS (Oz/Acre)
Permanent Grasses:		
Andropogon gerardii	Big Bluestem	48.00
Bouteloua curtipendula	Side-Oats Grama	16.00
Carex spp.	Prairie Sedge Species	4.00
Elymus canadensis	Canada Wild Rye	32.00
Elymus virginicus	Virginia Wild Rye	24.00
Panicum virgatum	Switch Grass	12.00
Schizachyrium scoparium	Little Bluestem	32.00
Sorghastrum nutans	Indian Grass	32.00
	Total	200.00
Temporary Cover:		
Avena sativa	Common Oat	512.00
Lolium multiflorum	Annual Rye	240.00
	Total	752.00

2. Stormwater Seed Mix

Botanical Name	Common Name	PLS Ounces/Acre
Permanent Grasses/Sedges/Rushes:		
Bolboschoenus fluviatilis	River Bulrush	1.00
Carex cristatella	Crested Oval Sedge	0.50
Carex lurida	Bottlebrush Sedge	3.00
Carex vulpinoidea	Brown Fox Sedge	2.00
Elymus virginicus	Virginia Wild Rye	24.00
Glyceria striata	Fowl Manna Grass	1.00
Juncus effusus	Common Rush	1.00
Leersia oryzoides	Rice Cut Grass	1.00
Panicum virgatum	Switch Grass	2.00
Schoenoplectus tabernaemont	Great Bulrush	3.00
Scirpus atrovirens	Dark Green Rush	2.00
Scirpus cyperinus	Wool Grass	1.00
	Total	41.50
Temporary Cover:		
Avena sativa	Common Oat	360.00
Lolium multiflorum	Annual Rye	100.00
	Total	460.00
Forbs & Shrubs:		
Alisma subcordatum	Common Water Plantain	2.50
Asclepias incarnata	Swamp Milkweed	2.00
Bidens spp.	Bidens Species	2.00
Eupatorium perfoliatum	Common Boneset	1.00
Helenium autumnale	Sneezeweed	2.00
Iris virginica v. shrevei	Blue Flag	4.00
Lycopus americanus	Common Water Horehound	0.50
Mimulus ringens	Monkey Flower	1.00
Penthorum sedoides	Ditch Stonecrop	0.50
Persicaria spp.	Pinkweed Species	2.00
Rudbeckia subtomentosa	Sweet Black-Eyed Susan	1.00
Rudbeckia triloba	Brown-Eyed Susan	1.50
Sagittaria latifolia	Common Arrowhead	1.00
Senna hebecarpa	Wild Senna	2.00
Symphotrichum lanceolatum	Panicled Aster	0.50
Symphotrichum novae-angliae	New England Aster	0.50
Thalictrum dasycarpum	Purple Meadow Rue	2.00
	Total	26.00

2.02 Live Branch Plantings

- A. Live branches shall be provided according to the species list below:
1. Cornus amomum Silky Dogwood
 2. Salix exigua Sandbar Willow

2.03 Herbicides

- A. Herbicides shall be EPA registered and approved, glyphosate and trichlopyr herbicides of the type recommended by manufacturer for application.
- B. The use of other chemicals must be approved by ENGINEER prior to application.

2.04 Erosion Control Materials

- A. Erosion-Control Blankets: Biodegradable wood excelsior, straw or coconut-fiber mat enclosed in a biodegradable mesh. Include manufacturer's recommended steel wire staples, of a length appropriate for site soil conditions.
- B. Erosion-control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92-lb/sq. yd., with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, of a length appropriate for site soil conditions.
- C. Blown and Crimped Straw Mulch: Only to be applied to areas with a slope rating of 10H:1 V or less.
- D. Coir Matting: Semi-permanent 100% biodegradable bristle coir woven blankets with 0.5" x 0.5" openings. BioD-Mat 70 blanket by CSI Geoturf, or approved equal.

Part 3 Execution

3.01 General

- A. The Contractor's on-site supervisor shall be on site at all times during seeding operations.

3.02 Examination

- A. Grades:
 - 1. The Contractor shall verify that grades have been established under Work of another Section to within 0.25 inches, plus or minus, of required finished grades. Notify the Engineer prior to commencing soil preparation Work if existing grades are not satisfactory or assume responsibility for conditions as they exist.
- B. Contaminated Soil:
 - 1. Do not perform any soil preparation work in areas where soil is contaminated with cement, plaster, paint or other construction debris. Bring such areas to the attention of the Engineer and do not proceed until the contaminated soil is removed and replaced.
- C. Dimensions:
 - 1. Before proceeding with seeding, the Contractor shall carefully check and verify dimensions and quantities and immediately inform the Engineer of any discrepancy between the Contract Drawings, specifications and actual conditions.
- D. Protection of Existing Features:

1. Protect all existing site development including, but not limited to, existing buildings, equipment, underground utilities, walls, materials, or vegetated areas including, but not limited to, trees, native grasslands, wetlands, or shrublands. Any existing site development damaged by willful or negligent acts of the Contractor or any of the Contractor's employees shall be replaced or repaired at no expense to the Owner and in a manner satisfactory to the Engineer before final acceptance is given for the Work specified herein.

3.03 Soil Preparation

A. Weed and Debris Removal:

1. All ground areas to be planted shall be cleaned of all weeds and debris prior to any soil preparation or grading work. Any growing noxious weeds on the site shall be pretreated with approved herbicide prior to grading. Annual or biennial weeds over two (2) feet tall shall be mowed, raked, and removed prior to grading. Weeds and debris shall be disposed of off the site.
2. Topsoil shall consist of loose friable loam, free of heavy clay, refuse, stumps and large roots, rocks over two (2) inches in diameter, brush, weeds and weed seeds, or other material which would be detrimental to the proper development of vegetative growth.

B. Organic Matter:

1. Topsoil should contain 3 to 5% organic matter, which shall be confirmed by an independent laboratory and submitted to the Owner and the Engineer in writing.

C. Moisture Content:

1. Soil shall not be worked when moisture content is so great that excessive compaction occurs, nor when it is so dry that dust will form in the air or clods will not break readily. Water shall be applied, if necessary, to bring soil to an optimum moisture content for tilling and planting.

D. Compaction:

1. The Contractor shall measure compaction of the subsoil before application of proposed topsoil, and again after application of the full six (6) inches specified as part of this Work. Compaction shall be measured with a Dickey-John soil compaction tester, or equal, to a depth of 12 inches, per 400 square feet (e.g., every 20 feet).
2. If readings average greater than 250 psi, the soil must be ripped, disced, or otherwise loosened to a depth of at least 12 inches until compaction readings average below 250 psi to provide proper conditions for plant root growth.
3. The Contractor shall then measure compaction of the topsoil again and provide further corrective measures, if necessary, until compaction is acceptable to the Engineer
4. Minimize compaction during all operations by utilizing equipment having low unit pressure ground contact and by limiting repeat passes over the same areas.

3.04 Fine Grading

- A. When weeding, soil preparation, and soil conditioning have been completed and soil has been thoroughly water settled, all planting areas shall be smooth-graded, ready for placement of plant materials and for seeding.
 - 1. Grades:
 - a. Finish grades shall conform to site grading plans and produce a smooth, even surface without abrupt changes, including the interface with the adjacent undisturbed landscape.
 - b. Finished grade shall be three-quarters (3/4) inch below top of adjacent pavement, curbs, or headers.
 - c. Tops and toes of all slopes shall be rounded to produce a gradual and natural-appearing transition between relatively level areas and slopes.
 - d. Minor adjustments of finish grades shall be made at the direction of the Engineer, if required.
 - 2. Drainage:
 - a. All grades shall provide for natural runoff of water without low spots or pockets. Flow-line grades shall be accurately set and shall be not less than two percent (2%) gradient wherever possible.

3.05 Site Inspection

- A. The Contractor and the Engineer shall inspect site prior to being accepted by the Engineer as complete and acceptable for the Contractor to proceed with seeding operations.

3.06 Seeding

- A. Broadcast Seeding:
 - 1. Broadcast seeding is preferred over drill seeding on graded, bare soil sites. Apply the seed uniformly over the surface using a combination seeder/cultipacker unit such as a Brillion or Truax Trillion seeder or equivalent.
 - 2. A cone seeder or other similar broadcasting equipment may also be used if the seed mix does not contain fluffy seeds in amounts sufficient to prevent free flowing without plugging. Seed should then be pressed into the surface using a cultipacker or roller.
- B. Seeding equipment, whether broadcast or drill, should be calibrated to deliver the seed at the rates and proportions specified in the plans. Equipment should be operated in such a manner as to ensure complete coverage of the entire area to be seeded, and seed must be placed no deeper than ¼ inch in the soil.
- C. No fertilizers or soil conditioners will be required or allowed.

3.07 Erosion Control Materials

- A. Seeding on steep slopes (greater than 5:1 or 3:1 as specified) shall be protected with erosion control blankets.
- B. Seeding on lesser slopes shall be protected with blown and crimped straw mulch at 1.5 tons per acre.
- C. Seed drilled into existing vegetation or on flat ground may not require erosion control protection.

3.08 Watering

- A. The Contractor shall be responsible for furnishing and applying water during the following periods, unless otherwise directed by the Engineer; the Engineer may add or subtract watering as conditions warrant. Notify the Engineer at least 3 days before each watering:
 - 1. From June 1 to June 15
 - 2. From June 23 to July 7
 - 3. From July 15 to July 29
 - 4. From August 4 to August 18
 - 5. From September 5 to September 19.

3.09 Field Quality Control

- A. Final Walk-Through:
 - 1. The final walk-through shall be performed at the completion of all planting operations under this Contract.
 - 2. At the time of the final walk-through, the Contractor shall have planting areas free of debris and litter shall be cleaned up; walkways, curbs, and roads shall be cleared of soil and debris.
 - 3. The inspection shall not occur until these conditions are met.
 - 4. The Engineer will identify any deficiencies in the form of a written punch list, which will be submitted to the Contractor within two (2) days of the final walk-through.
 - 5. The Contractor will have ten (10) days after receiving the punch list to correct or complete any noted deficiencies.
 - 6. The Engineer will give written notice of final acceptance when the Work of has been performed in compliance with the Contract Documents.
 - 7. The Contractor shall maintain site until final acceptance.

3.10 Cleanup and Protection

- A. Promptly remove soil and debris from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Allow only vehicles and equipment required to perform and maintain work of this section onto completed areas.

End of Section

Specifications

Division 33 Utilities

Section 33 4100

Storm Utility Drainage Piping

Part 1 General

1.01 Scope

This Section includes storm sewer Work indicated on the Plans complete with pipes, joints, structures, pipe bedding, final inspection and appurtenances.

1.02 Related Work Specified Elsewhere

1. Unit Prices: Section 01 2200
2. Mortaring and Grouting: Section 04 0511
3. Dewatering: Section 31 2319
4. Structural Excavation and Backfill: Section 31 2316
5. Trenching and Backfilling: Section 31 2333
6. Tunneling and Minng: Section 31 7000

1.03 Reference Standards

Unless otherwise specified, the Work for this Section shall conform to the applicable portions of the following Standard Specifications:

ANSI- American National Standard Institute

ASTM- ASTM International

AASHTO- American Association of State Highway Transportation Officials

MDOT- Michigan Department of Transportation, Standard Specifications for Construction, latest edition

NCPI- National Clay Pipe Institute

1.04 Source Quality Control

Laboratory test not less than one (1) percent, with a minimum of three (3) pieces each size, material and class of gravity pipe required in the Work.

1.05 Submittals

Submit a complete field report of the location of all wye openings and sump pump discharge leads to the ENGINEER at the end of each sewer section of the Project or on the last day of each week, whichever occurs first.

Submit two (2) copies of the laboratory test reports required per Article 1.04 of this Section to the ENGINEER.

Complete Shop Drawings for all manhole tees shall be submitted to the ENGINEER.

Submit shop drawings and design information for all precast concrete box sections.

1.06 Storage of Materials

Piping material shall not be stacked higher than four (4) feet (1.2 m) or as recommended by the manufacturer, whichever is lowest. Suitable racks, chairs, and other supports shall be provided to protect preformed pipe mating surfaces from damage. Store bottom tiers off the ground, alternate tiers and chock tier ends.

Jointing and sealing materials used in the storm sewer system shall be protected from sunlight and stored in as cool and clean a place as practicable until ready for application.

1.07 Handling of Material

Load and unload materials using suitable approved equipment. Material shall not be dropped, bumped or allowed to impact against itself. Damaged material shall be rejected by the ENGINEER.

Lifting devices shall be suited to the Work and shall protect surfaces from damage.

Part 2 Products

2.01 Materials

It is the intent of the Articles in Part 2 of this specification section is to specify in detail the various types of sewer pipe, joints, manholes, etc. which have been indicated throughout the Plans and Specifications. These Articles shall not be construed as allowing any alternate type of material to that which is indicated on the Plans or elsewhere in the Specifications.

2.02 Clay Pipe

Clay pipe shall conform to ASTM C700, extra strength vitrified clay pipe.

Premium joints shall be compression type joints conforming to ASTM C425.

When not specified, joints shall be made with cold applied pipe joint sealer. See Article 2.07 for requirements for cold applied pipe joint sealer.

2.03 Nonreinforced Concrete Pipe Systems

Pipe shall conform to ASTM C14 Class III nonreinforced concrete sewer pipe.

When not specified, pipe joints shall be made with cold applied pipe joint sealer. See Article 2.07 for requirements for joints.

2.04 Reinforced Concrete Pipe

Reinforced concrete pipe shall conform to ASTM C76. Twelve (12) inch thru 30-inch (300 mm thru 750 mm) diameter pipe shall be Class II thru V, Wall B or Wall C, circular reinforced. Thirty-six (36) inch through 108-inch (900 mm thru 2700 mm) diameter pipe shall be Class I through V, Wall B or Wall C, circular reinforced or elliptical reinforced.

When elliptical reinforcement is used, the following method of indexing the steel and the pipe barrel shall be used.

A dummy lift pin form shall be set in the outer pipe wall form projecting into the pipe wall a minimum of 1-3/4 inches (45 mm) and a maximum of 2-1/4 inches (55 mm). An additional spacer chair shall be welded to the elliptical steel cage at the proper location so as to engage the dummy lift pin form during the pipe casting operation.

It is the intent of the spacer chair and dummy lift pin arrangement to provide a means of assuring the final position of the elliptical steel cage within the barrel of the pipe and, further, for providing a means of indexing the pipe in the field to assume proper placement of the pipe.

Prior to shipment of the elliptically reinforced pipe, they shall be striped along the inside top with a minimum 1-inch (25 mm) wide indelible marker so that final inspection of the pipe orientation can be made following completion of the installation.

For circular pipe 114 inches (2850 mm) or larger in diameter, the design information in accordance with Section 6 of ASTM C76, shall be submitted to the ENGINEER for approval, prior to fabrication.

The design of all pipes shall meet the d-load requirements for the class of pipe indicated on the Plans.

When not specified, pipe joints shall be made with cold applied pipe joint sealer. See Article 2.07 for requirements for joints.

2.05 Reinforced Concrete Elliptical Pipe

Reinforced concrete elliptical pipe shall conform to ASTM C507.

When not specified, pipe joints shall be made with cold applied pipe joint sealer. See Article 2.07 for requirements for joints.

2.06 Precast Concrete Box Section

Precast concrete box sections shall meet the requirements of ASTM C1433. Unless specified otherwise, CONTRACTOR shall use the same design conditions as exist at the time of construction or as planned for future development.

2.07 Joints for Concrete or Clay Pipe

A. Sealed Joints

When not specified, pipe joints shall be made with cold applied pipe joint sealer. Cold-applied pipe joint sealer shall conform to MDOT Section 909.09. The bituminous material shall be of such consistency that it may be spread on the joints with a trowel when the temperature of the air is between 20 degrees F and 100 degrees F (-10°C and 40° C).

The bituminous material shall adhere to the pipe so as to make a watertight seal and shall not flow, crack or become brittle when exposed to the atmosphere.

B. Premium Joints

Premium joints for circular pipe shall conform to ASTM C443 limited as follows: Section 5.1 of C443, "Physical Requirements for Gaskets," shall be replaced with Section 6.9 of C361, "Rubber Gaskets." Also, Section 5 of C443 shall be limited to a modified grooved tongue to receive a rubber gasket.

Premium joints for elliptical pipe shall conform to ASTM C877, external sealing bands for non-circular concrete pipe. The width of the sealing bands shall be at least equal to twice the depth of the groove. For modified bell tongue and groove pipe, use the next larger gasket. The length of the sealing bands shall be equal to the outside circumference of the pipe at its largest diameter plus an amount equal to the width of the gasket to be used.

Only lubricant, as supplied by the pipe manufacturer, shall be used on the groove and on the tongue in making up joints, and the joints shall be coupled in accordance with the pipe manufacturer's requirement.

The inside annular space of all concrete pipe 36-inch (900 mm) diameter (or equivalent) and larger shall have the inside annular space filled with cement mortar and troweled flush. Mortar shall consist of 1-part Portland cement and two (2) parts of plaster sand. Mortar for inside joints shall be mixed with only enough water for "dry packing."

2.08 Corrugated Metal Pipe

A. Galvanized Corrugated Metal Pipe

Corrugated galvanized steel pipe with circular cross section and corrugated galvanized steel pipe with pipe-arch shape shall conform to the requirements of AASHTO M36, and as specified in MDOT Section 909.05. Helical corrugated pipe shall have a minimum of two (2) circumferential corrugations rerolled on each end of each section of pipe.

B. Polymeric Coated Corrugated Galvanized Steel Pipe

Polymeric coated corrugated galvanized steel pipe with circular cross section and polymeric coated corrugated galvanized steel pipe with pipe-arch shape shall conform to the requirements of AASHTO M245, and as specified in MDOT Section 909.05. Helical corrugated pipe shall have a minimum of two (2) circumferential corrugations re-rolled on each end of each section of pipe.

C. Aluminized Type 2 Corrugated Metal Pipe

Type 2 aluminized corrugated steel pipe with circular cross section and corrugated steel pipe with pipe-arch shape shall conform to the requirements of AASHTO M36, AASHTO M274, Type 2 and as specified in MDOT Section 909.05. Helical corrugated pipe shall have a minimum of two (2) circumferential corrugations re-rolled on each end of each section.

D. Corrugated Aluminum Alloy Pipe

Corrugated aluminum alloy pipe with circular cross section and corrugated aluminum alloy pipe with arch-pipe shape shall conform to the requirements of AASHTO M196 and MDOT Section 909.05.

E. Joints for Corrugated Metal Pipe

The joints for corrugated metal pipe shall be made by use of coupling bands. The coupling bands shall be of the same material as specified for the pipe and shall prevent infiltration of the side fill material. Coupling bands shall be corrugated to match the corrugations of the pipe to be jointed, and shall include two (2) "O" ring neoprene gaskets for each joint. Dimple bands shall not be used. All joints shall be wrapped with a 3 foot (1 m) wide geotextile filter fabric centered on the joint.

When called for in the Contract Documents, joints shall have bell and spigot coupling system and rubber gasketed joint.

2.09 Dual Wall Corrugated PVC Pipe – Smooth Interior

Pipe shall be a single extrusion of PVC with smooth interior and corrugated outer walls. Corrugated outer profile shall be annular and seamless. Pipe and fittings shall be in accordance with ASTM F949. Joints shall be bell and spigot

type with a elastomeric gasket meeting the requirements of ASTM F477 and be suitable for storm sewer service.

Wyes or tees shall be a molded wye or tee fitting per ASTM F949, with gasketed joints on each end suitable for directly inserting in the mainline pipe. Branch connection fitting shall be a gasketed joint suitable for the house lead pipe specified. Saddle connections are not allowed.

Acceptable manufacturers of Dual wall corrugated pipe include Contech A2000, Uponor ETI Ultra-Corr or ENGINEER approved equal.

2.10 Corrugated Polyethylene Pipe

A. Smooth-Lined Corrugated Polyethylene Pipe

Smooth lined corrugated polyethylene pipe shall meet the requirements of MDOT section 909.06 and AASHTO M252, Type S for sizes 4" to 10" diameter, and AASHTO M294 Type S for 12" to 48" diameter.

Fittings shall conform to the corresponding pipe specification and be constructed of the same material classification as the pipe. Fittings shall be welded on the interior and exterior at all junctions.

Joints shall be bell & spigot type with rubber gaskets on both sides of the joint conforming to MDOT section 909.03 and ASTM F477. Split collar couplers are not allowed. Joints shall be watertight meeting the performance requirements of ASTM D3212.

B. Corrugated Plastic Edge Drain / Underdrains.

Corrugated plastic tubing for edge drains or underdrains shall meet the requirements of AASHTO M252 for polyethylene tubing. Pipe shall be wrapped in a Geotextile Pipe Wrap per MDOT Section 910.03.A.

2.11 Smooth Plastic Pipe

Smooth plastic pipe for underdrains shall be polyvinyl chloride PVC meeting the requirements of AASHTO M278. Pipe shall be wrapped in a Geotextile Pipe Wrap per MDOT Section 910.03.A.

2.12 Structural Plates for Field Assembly of Pipe, Pipe-Arches, and Arches

The plates, bolts and nuts to be used in field assembled circular pipe, pipe-arches and arches shall meet all applicable requirements of AASHTO M167 and as specified in MDOT Section 909.

2.13 End Sections

The precast concrete end section shall conform to ASTM C76, Class II and as specified in MDOT Section 909.04. The joint for connection to pipe shall be by means of a standard tongue and groove with cold-applied pipe joint sealer. See Article 2.07 of this Section for requirements for the cold-applied pipe joint sealer.

Metal end sections shall conform to MDOT 909.05. See Article 2.08 for requirements for joints.

2.14 Storm Structures

Materials for storm sewer structures shall conform to the requirements indicated on the Plans and as specified below.

A. Concrete Brick

Concrete brick shall be ASTM C55, Grade S-II, solid units of nominal 3-inch (75 mm) thickness.

B. Concrete Block

Block shall conform to ASTM C139, manufactured of Portland cement conforming to ASTM C150, Type II. Blocks shall be solid curved blocks with the inside and outside surfaces parallel and curved to the required radii. The blocks shall have a groove or other approved type of joint at the ends. Blocks intended for use in the cones or tops of manholes shall have such shape as may be required to form the structure as indicated on the Plans.

C. Precast Concrete

Precast concrete manhole, flat top slabs, risers, cone, bases, grade rings, transition sections and bottom sections shall conform to ASTM C478, and shall be circular with circular reinforcement. For depths greater than 32-feet, the manhole shall be designed for the earth loading at the design depth of bury with a factor of safety of 1.5. Base slab shall be

minimum eight (8) inches (200 mm) thick for depths up to 25 feet (7.5 m) and minimum 12 inches (300 mm) thick for depths greater than 25 feet (7.5 m).

Transition sections, reducers and flat top slabs shall be designed for the earth loading at the design depth of bury with a factor of safety of 1.5.

Precast concrete manhole tee units shall conform to ASTM C76, Class IV and shall be circular with circular reinforcement. Shop Drawings shall be provided for all manhole tees. The joints on the precast manhole tee shall be the same as the joints on the storm sewer section.

D. Manhole Steps

Cast iron manhole steps shall conform to ASTM A48, Class 30, gray iron with a minimum cross section dimension of 1-inch (25 mm) in any direction.

Steel reinforced plastic steps shall be of suitably approved co-polymer polypropylene conforming to ASTM D4101, PP0344B33534Z02 with 1/2 inch (12 mm) minimum diameter deformed reinforcing bar conforming to ASTM A615, Grade 60.

Manhole steps shall be of the type and size indicated on the Plans and shall comply with applicable occupational safety and health standards. Manhole steps shall be installed at locations indicated on the Plans.

E. Frames and Covers

Frames and covers for manholes, catch basins, and inlets shall conform to ASTM A48, Class 30, gray iron and shall be of the types and sizes as indicated on the Plans. The castings shall be neatly made and free from cracks, holes and other defects. Surfaces of casting shall be ground to assure proper fit and to prevent rocking.

2.15 Concrete

In accordance with MDOT Section 701, use Grade S2; 3,500 psi (24 MPa) strength; Type IA cement; 6.0 sacks cement per cubic yard (335 kg/m³); 6A coarse aggregate; 2NS fine aggregate; 6.5% ± 1.5%

air content; 3-inch (75 mm) maximum slump; no admixtures without the ENGINEER's approval.

2.16 Concrete Reinforcement

In accordance with MDOT Section 905, use ASTM A615, Grade 60 for bars and ASTM A185 for welded wire fabric.

Part 3 Execution

3.01 Verification of Excavation and Bedding

Prior to the installation of any storm sewer piping, structures, or materials, examine all trenches and other excavations for the proper grades, lines, levels and clearances required to receive the new Work. Ascertain that all excavation bottoms, compacted subgrades and pipe bedding are adequate to receive the storm sewer materials to be installed. Correct all defects and deficiencies before proceeding with the Work.

3.02 Existing Storm Sewers and Drains

Expose the existing storm sewer and structures to which the new Work is to be connected and notify the ENGINEER of same. The ENGINEER will verify the vertical and horizontal locations of the existing system and shall inform the CONTRACTOR as to the necessary adjustments required to align the new storm sewer Work with the existing system.

3.03 Preparation

The outside surface of the spigot end and the inside surface of the bell end of the pipe shall be cleaned and free of any foreign materials, other than the sealant recommended by the manufacturer, prior to installation.

All pipe, frames, covers, accessories, and appurtenances shall be examined carefully for damage and other defects immediately prior to installation. Defective or damaged material shall be rejected and removed from the Project by the CONTRACTOR.

3.04 Installation - General

Each section of pipe, when placed to grade and line, shall have firm bearing on the trench bedding throughout its length.

Cutting of pipe shall be done with approved tools and by approved methods suitable for the pipe material. Pipe cutting methods that produce a smooth, square-cut end without damage to the pipe and that minimize air-borne particles, shall be employed. Pipe cutting shall be performed using the recommendations of the manufacturer of the type of the pipe materials being cut and according to the best trade practices. When cutting pipe, care shall be taken to prevent damage to the interior and exterior surfaces. Damage to either shall be cause for rejection of a complete section of pipe.

During the preparation of the pipe bedding and until the trench has been satisfactorily backfilled, the trench shall be kept free of water. A dewatering system, in accordance with Section 31 2319, Dewatering, shall be provided and maintained by the CONTRACTOR. The dewatering system shall remain in operation until the trench is backfilled.

Backfill shall be as indicated on the Plans and as specified in Section 31 2333, Trenching and Backfilling.

3.05 Pipe Laying

Installation of pipe shall conform to ASTM C12, and as recommended by the pipe manufacturer. The pipe shall be protected during handling against impact shocks and free fall. Hooks shall not be permitted to come in contact with premolded joint surfaces.

Pipes having premolded joint rings or attached couplings shall be handled so that no weight, including the weight of the pipe itself, will bear on or be supported by the jointing material. Care shall be taken to avoid dragging any pipe on the ground or allowing it to be damaged by contact with gravel, crushed stone, or other hard objects.

All pipe shall be laid to the line and grade called for on the Plans. Each pipe as laid, shall be checked by the CONTRACTOR with line and grade pole or laser system to insure that this result is obtained. When employing a laser system, the CONTRACTOR shall have an independent and alternate means of checking the line and grade.

The finished work shall be straight and shall be sighted through between manholes.

Construction shall begin at the outlet end and proceed upgrade with spigot ends pointing in direction of flow. Bell holes shall be excavated so that the full length of the barrel will bear uniformly on the bedding material.

Lubricants, primers or adhesives as recommended by the pipe or joint manufacturer shall be used immediately prior to jointing.

The pipe shall be centered in the bells or grooves and pushed tight together to form a smooth and continuous invert. After laying of pipe, care shall be taken so as not to disturb its line and grade. Any pipe found off grade or out of line shall be re-laid properly by the CONTRACTOR.

Mechanical means shall be used for pulling home all pipe where manual means will not result in pushing and holding the pipe home. Mechanical means shall consist of a cable placed inside of the pipe with a suitable winch, jack, or come along for pulling the pipe home and holding the pipe in position.

Circular concrete pipe with elliptical reinforcement shall be installed with the lift holes to the top of the pipe. The manufacturer's marks designating the top and bottom of the pipe shall not be more than five degrees from the vertical plane through the longitudinal axis of the pipe. After the pipe is installed, the lift holes shall be sealed with suitable concrete plugs.

Type HE elliptical pipe shall be installed with the longer axis placed horizontally within a tolerance of \pm five degrees.

Type VE elliptical pipe shall be installed with the longer axis placed vertically within a tolerance of \pm five degrees.

3.06 Pipe Bedding

After the bottom of trench has been excavated the pipe bedding material will be installed in accordance with Section 31 2333, Trenching and Backfilling. The pipe shall then be installed strictly in accordance with the manufacturer's recommendations. After the pipe is laid, the bedding shall be continued above the pipe as

specified in Section 31 2333, Trenching and Backfilling. Particular care shall be taken to assure filling and tamping all spaces under, around and above the top of the pipe.

A continuous and uniform bedding as specified in Section 31 2333, Trenching and Backfilling, shall be provided in the trench for all buried pipe.

3.07 Underdrains

The pipe shall be laid in close conformity with the lines or grades shown on the Plans or established by the ENGINEER. The upgrade ends of all underdrains shall be closed with suitable plugs to prevent entry of soil or other foreign material.

Perforated pipe shall be laid with the perforations down.

Underdrains shall be bedded in MDOT open graded drainage course material. The bedding shall have a minimum thickness beneath the pipe of four (4) inches (100 mm), a minimum width of six (6) inches (150 mm) on each side of the pipe and extend to a level not less than 12 inches (300 mm) above the top of the pipe.

The bedding shall be placed equally on both sides of the underdrain at the same time. Staking or other methods to restrain the pipe may be necessary during the backfilling operation to maintain the line and grade of the underdrain.

Rodent screens and outlet endings are required for all underdrains which terminate in a ditch or swale.

3.08 Storm Structures

Construct storm sewer manholes, catch basins, inlets and other structures to the grades, lines and levels indicated on the Plans and as specified. Structures shall be complete with concrete bases, reinforcing, frames, covers, adjustment bricks, etc., as shown and as required for a complete installation. Storm sewer structures shall conform to the type of material and dimensions indicated on the Plans.

Cast-in-place structures shall be constructed in accordance with Section 03 3000, Cast-In-Place Concrete.

A. Block Structures

Construct concrete block structures in the locations and according to the details on the Plans. The first course of concrete blocks shall be placed on the prepared base or footings in a full bed of mortar. Mortar joints shall be full and close in all courses. Courses shall be level throughout. Stagger joints in adjoining courses by one-half the length of the block as nearly as practicable. Joints shall be uniform in thickness throughout the structures. Strike all joints and properly point to provide true, smooth surfaces.

B. Precast Concrete Structures

Construct precast concrete structures as detailed on the Plans. Provide mortar joints struck smooth. Provide three (3) to five (5) courses of 8-inch (200 mm) brick or concrete grade rings at top of structure for future adjustment of castings.

A cement mortar plaster coat shall be applied to the exterior surfaces of the brick and block sections of all storm structures as indicated on the Plans. Plaster coat shall be 1/2 inch (10 mm) thick.

Provide and install all frames and covers to the elevations indicated on the Plans. Castings shall be set in a full bed of cement mortar 1/2 inch (10 mm) thick, minimum. Mortar joints shall be struck smooth.

Steps shall be installed at the plant by the manufacturer of precast units. Field install steps for brick, block, or cast in place structures of the types and in the locations indicated on the Plans.

Pipe up to 42 inches (1050 mm) in diameter, shall be connected to storm structures using a grouted joint, as indicated on the Plans. The pipe shall be properly supported, so that any settlement will not disturb the connection.

For pipe, 48 inches (1200 mm) in diameter or larger, the pipe shall be installed as an integral part of the manhole which shall be constructed of 3,500 psi (24 MPa) concrete and reinforcing, as indicated on the Plans.

Manhole tees, as indicated on the Plans, may be used for pipe 42 inches (1050 mm) in diameter or larger. Connection to manhole tees shall be made

using tees and pipe having the same type of joint. The pipe and tee shall be properly supported with concrete as indicated on the Plans.

Sump shall be provided, as indicated on the Plans, in all catch basins and storm manholes having outlets of 18 inches (450 mm) in diameter or less.

Flow channels shall be constructed in all structures not requiring a sump and shall be constructed as indicated on the Plans.

3.09 Field Quality Control

After all the pipe and structures have been laid, constructed and backfilled, the system shall be final inspected. The sewer system shall be ready for the final inspection within two (2) weeks after the completion of each 2,000-foot (600 m) section of sewer installed.

The final inspection shall consist of a visible and audible check of the sewers and structures to ascertain that the steps have been placed, all lift holes jointed, the channeling of the manhole bottoms completed, all visible or audible leaks stopped, all pipe has been placed straight and true to the proper slopes and elevations, the required brick courses for adjustment, the frame and cover properly installed, the required end section installed, all trenches and structures backfilled in a workmanlike manner and that the system has been thoroughly cleaned.

The final inspection shall be considered complete when all the repairs have been made.

3.10 Deflection Test for Plastic Pipe

Plastic pipe shall be tested for deflection, but no sooner than 30 days following the backfilling of the pipe. Maximum allowable deflection (reduction in vertical inside diameter) shall be five (5) percent. Locations with excessive deflection shall be excavated and repaired by re-bedding and/or replacement of the pipe. Optional devices for testing include a deflectometer, calibrated television or photography, or a properly sized "go, no-go" mandrel or sewer ball. Mandrel shall have a minimum of nine (9) legs.

3.11 Remove Storm Sewer

Excavate and remove the existing storm sewer where indicated on the plans. Bulkhead the

opening in storm sewers or structures where the existing storm sewer has been removed. Where removal of existing storm sewer is occurring in essentially the same location as a new sewer or structure, the removal of the existing sewer is incidental to the project.

3.12 Remove Culverts

Excavate and remove culverts where indicated on the plans. Backfill the completed work as specified under "Backfilling Trenches" in Section 31 2333, Trenching and Backfilling.

3.13 Remove Structure

Excavate and remove structures where indicated on the plans. Bulkhead the ends of any sewers remaining in place. Backfill the completed work as specified under "Backfilling Trenches" in Section 31 2333, Trenching and Backfilling. Removal of existing storm structures is incidental to the project if a new structure or sewer is being constructed in essentially the same location.

3.14 Remove and Replace Storm Sewer

Remove and replace storm sewer shall consist of the complete removal and disposal of the existing sewer and replacement with the size and type of sewer as called for on the plans or specified. All materials and installation shall be in accordance with the requirements of this section and Section 31 2333, Trenching and Backfilling, as applicable.

3.15 Remove and Replace Storm Structure

Remove and replace storm structure shall consist of the complete removal and disposal of the existing structure and replacement with the size and type of structure as called for on the plans or specified. All materials and installation shall be in accordance with the requirements of this section and Section 31 2333, Trenching and Backfilling, as applicable.

End of Section

Section 33 4400 Storm Utility Water Drains

Part 1 General

1.01 Scope

This Section includes open drain construction complete with excavation and disposal of excavated material, backfilling and grading of abandoned open drains, maintaining overland drainage and cleanout of existing open and enclosed drains.

1.02 Related Work Specified Elsewhere

1. Unit Prices: Section 01 2200
2. Temporary Erosion and Sediment Control: Section 01 5713
3. Site Construction Performance Requirements: Section 01 8900
4. Clearing and Grubbing: Section 31 1100
5. Grading: Section 31 2200
6. Structural Excavation and Backfill: Section 31 2316
7. Dewatering: Section 31 2319
8. Slope Protection: Section 31 3500
9. Seeding: Section 32 9219
10. Sodding: Section 32 9223
11. Storm Utility Drainage Piping: Section 33 4100

1.03 Allowable Tolerances

All areas to be excavated shall be trimmed and dressed to conform to the lines, grades and cross sections shown on the Plans within the following tolerances:

The finished surface elevation of all channel bottoms shall be within \pm 1-inch (25 mm) of Plan elevation.

The finished surface elevation of all channel areas, other than the channel bottoms, shall be within \pm two (2) inches (50 mm) of Plan elevation.

1.04 Job Conditions

All trees, shrubs and other types of vegetation not within the Work limits designated on the Plans or by the ENGINEER shall be carefully protected from damage or injury during the entire drain construction operation. Any trees, shrubs, or other types of vegetation not designated to be removed but which are damaged by the CONTRACTOR's operation shall be replaced by the CONTRACTOR. All costs incurred shall be incidental to the open drain construction operation.

All existing buildings, fences, culverts, drain tile, utility poles, overhead lines, underground conduits, underground cables, sewers, structures, or other types of improvements within the drain right-of-way limits not designated on the Plans to be removed, shall be carefully protected from damage during the drain construction operation. Any type of existing structure or improvement not designated to be removed but which damaged by the CONTRACTOR's operation shall be repaired or replaced by the CONTRACTOR. All costs incurred shall be incidental to the drain construction operation.

Part 2 Products (Not Used)

Part 3 Execution

3.01 Performance – General

The construction shall begin at the outlet end of the open drain and proceed upstream, unless otherwise authorized by the ENGINEER.

Prior to the commencing of excavation or cleanout of the open drain and until the satisfactory completion of the open drain construction operation, the drain shall be kept free of water. A dewatering system shall be provided and

maintained by the CONTRACTOR as specified in Section 31 2319, Dewatering.

3.02 Disposal Areas

If disposal areas for unsuitable materials are not specified on the Plans, the CONTRACTOR, at his expense, shall furnish and maintain a disposal area. Spoil disposal areas that may be designated on the Plans are not for disposal of unsuitable materials unless otherwise specified on the Plans or as determined by the ENGINEER.

3.03 Clearing and Grubbing

The drain right-of-way and spoil deposit areas, designated on the Plans or as determined by the ENGINEER, shall be cleared and grubbed prior to actual excavation of the open drain as provided for in Section 31 1100, Clearing and Grubbing.

Along the open drain, the clearing and grubbing Work shall precede the excavation operation by at least a 1/2 mile (800 m).

Clearing and grubbing shall consist of preparing an area for excavation or fill by removing unsuitable materials and vegetation which interferes with the proposed Work, and shall include the preservation from injury or defacement of all material ground cover, trees, and other vegetation and improvements designated to remain. The clearing and grubbing operations, including removal and disposal of unsuitable materials, shall be considered incidental to the Project and shall be considered part of the excavation pay item.

3.04 Removing and Salvaging Topsoil

Topsoil shall be salvaged in an amount equivalent to the quantity required for the Work specified on the Plans or as designated by the ENGINEER. Topsoil in excess of the required amount, will be disposed of at the CONTRACTOR's expense. When additional topsoil is required to complete the drain construction operation, the CONTRACTOR, at his expense, shall furnish, place, and spread the additional topsoil.

The all vegetation shall be cut to a height of approximately two (2) inches (50 mm), and the topsoil shall be free of foreign materials prior to removal and shall be removed in such a manner as to avoid the lifting of subsoils. Topsoil shall be

removed within the grading limits for cuts, and shall be removed to width and depth as specified on the Plans or as directed by the ENGINEER.

Topsoil shall be stockpiled within the drain right-of-way, outside of the construction area. The topsoil shall be stockpiled separate from other excavated materials to be used for embankments or subject to disposal. The topsoil shall be located as near the original location as possible, as no payment will be made for overhauls. The topsoil shall be stockpiled at locations so as to avoid placing the material around tree trunks or over root systems of trees to be preserved.

The cost of topsoil removal, stockpiling, hauling, spreading and grading shall be considered incidental to the Project.

3.05 Excavation

The open drain shall be excavated to the lines, grades, dimensions and cross sections specified on the Plans.

Excavation shall consist of the removal and disposal of all materials necessary to construct the open drain. The material removed shall be placed in suitably prepared spoil disposal areas. If spoil disposal areas are not specified on the Plans, the CONTRACTOR, at his expense, shall provide and maintain a disposal area.

Construction, excavation and disposal operations shall be performed in such a manner and sequence that adequate drainage will be maintained at all times.

When wet or unstable soil conditions are encountered during the excavation operation, the CONTRACTOR shall immediately cease operations and notify the ENGINEER. At the approval of the ENGINEER, the CONTRACTOR, in addition to dewatering, may make changes in the Work to facilitate the dewatering and stabilizing of the soils. Cost incurred for dewatering and stabilizing the soils shall be at the CONTRACTOR's expense.

When indicated on the Plans or when wet or unstable soils are encountered, the initial construction of the drain shall be excavation of a pilot channel no less than 30 days in advance of completing final drain side slopes. The ENGINEER will determine when drain slopes

have stabilized sufficiently to allow for final slope shaping.

The pilot channel excavation shall have a bottom width of approximately one-half the proposed final width with 1:1 side slopes and shall be excavated to the elevations indicated on the Plans. The pilot channel shall not be excavated upstream from any bridge requiring bridge protection work or replacement until the scheduled work for such bridge has been completed, unless otherwise approved by the ENGINEER.

When stones, boulders, or rocks are encountered during the excavation, they shall be removed and disposed of as unsuitable material. After the stones, boulders, or rocks have been removed, any holes or voids created, which continue below the Plan grade, shall be backfilled with approved materials, and compacted, to the satisfaction of the ENGINEER.

When ledge rock is encountered, the CONTRACTOR shall immediately cease operations and notify the ENGINEER of his findings.

Costs incurred for removal and disposal of stones, boulders, and rocks in addition to backfilling and compaction shall be at the CONTRACTOR's expense.

Blasting will not be permitted, unless otherwise specified on the Plans or at the approval of the ENGINEER.

3.06 Grading Requirements

Channel areas receiving a slope protection as specified on the Plans, shall be excavated to a depth sufficient to provide for installation of the protective materials, meeting the finished surface grade tolerances.

The additional excavation necessary to provide for slope protection shall be considered incidental to the cost of the Project.

In areas where the CONTRACTOR over excavates, the over excavation area shall be backfilled with approved materials and compacted at the CONTRACTOR's expense.

Grades shall be finished in a condition satisfactory to the ENGINEER immediately prior to the placement of slope protective materials.

Trimming and finishing the earth grade will be considered incidental to the excavation.

3.07 Soil Erosion and Sedimentation Control

The CONTRACTOR, at his expense, shall provide, maintain and remove such temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or as determined by the ENGINEER. The measures shall prevent surface runoff from carrying excavated materials into the drain, to reduce erosion of the slopes, and to prevent silting in of drain downstream of the Work. Also, the measures should include provisions to reduce erosions by the wind of all areas stripped of vegetation, including material stockpiles.

Comply with requirements of Section 01 5713, Temporary Erosion and Sediment Control.

3.08 Slope Stabilization

After completion of the grading operation, and prior to the placing on any protective covering, the ENGINEER shall inspect the slopes for any signs of internal water movement as indicated by seepage and soil slippage, and for the existence of unstable slope conditions.

The CONTRACTOR shall take the necessary measures to stabilize the slopes including removal and disposal of unsuitable or unstable materials, the backfilling with approved material, and compaction. The cost incurred for slope stabilization shall be considered incidental to the excavation.

3.09 Spoil Disposal Areas

Excavation, free from unsuitable materials shall be deposited in approved spoil disposal areas, as specified in Section 01 8900, Site Construction Performance Requirements.

Depositing of spoil materials in existing watercourses or drains shall be prohibited, unless otherwise specified on the Plans. The spoil material shall be deposited, compacted and graded to provide drainage. Swales shall be constructed

when necessary to provide positive drainage to drain.

3.10 Culverts

New culverts or culverts to be relayed as indicated on the Plans shall be installed as required in Section 33 4100, Storm Utility Drainage Piping. Special care will be taken in removing, salvaging, storing, handling or placing culverts so that they are not damaged.

Only culverts meeting the approval of the ENGINEER may be relayed.

Any culverts having the protective coating scraped or otherwise damaged, shall be repaired by the CONTRACTOR, at his expense, to the satisfaction of the ENGINEER.

Corrugated steel pipe, when specified, will be layed with the outside laps of circumferential joints pointing upstream and with longitudinal laps at the sides at about the vertical mid-height of the culvert.

When existing culverts are to be relayed, the inverts shall be rotated 180 degrees.

The CONTRACTOR shall make arrangements with the land owner and/or land user for the removal of culverts. The CONTRACTOR shall provide the ENGINEER with a copy of the arrangements made, bearing the signature of the landowner and/or land user.

Any culvert removed and not relayed, shall be disposed of by the CONTRACTOR, at his expense.

Culverts which are removed, shall be relayed, when specified, at the culvert crossing from which they were removed. Salvaged culverts shall not be used at any other location, unless otherwise authorized by the ENGINEER.

3.11 Tile Outlets

The CONTRACTOR shall contact existing landowners and land users to locate and flag the location of all known tile outlets to be protected during the excavating operation. The CONTRACTOR shall not proceed with the Work until the tile outlet locations have been so marked.

The CONTRACTOR will be responsible for leaving the tile outlets in good repair and in working order.

It may become necessary to shorten the length of existing tile outlets and recess them back into the newly shaped slope. This Work shall be considered incidental to the Project.

When called for on the Plans new outlets shall be installed and shall conform to the materials specified. A suitable rodent guard shall be furnished and placed on the end of new outlet, at the CONTRACTOR's expense. Existing rodent guards shall be relocated by the CONTRACTOR, and this Work shall be considered incidental to the Project.

When it is apparent a tile outlet is carrying human or animal waste material from a home or barnyard area, the CONTRACTOR will request the County Health Department approval before reconnecting the outlet to the drain.

3.12 Bridges

Existing bridges shall be removed and disposed of or shall be removed, salvaged and reinstalled, as specified on the Plans. Care shall be taken when removing, salvaging, storing, handling and installing the existing bridge.

The CONTRACTOR shall make arrangements with the landowner and/or land user for the removal of the bridge. The CONTRACTOR shall provide the ENGINEER with a copy of the arrangements made, bearing the signature of the landowner and/or land user.

3.13 Cleanout of Drain

Cleanout of the existing drain shall include the clearing and grubbing of all trees, brush, stumps and other vegetation in accordance with Section 31 1100, Clearing and Grubbing. Excavation shall be in accordance with Article 3.05 of this Section.

Enclosed drain cleanout shall include the complete removal and disposal of all sediment, silt, dirt, debris and other miscellaneous items to the bottom of the culvert or to the elevation shown on the plans, or as determined by the ENGINEER.

At the completion of the cleanout the CONTRACTOR shall restore all areas disturbed with topsoil, seed, fertilizer and mulch, or topsoil and sod.

End of Section

Specifications

Division 35 Waterway and Marine Construction

Section 35 6100 Turbidity Barrier

Part 1 General

1.01 Summary

- A. The work shall include furnishing, placing, and maintaining a temporary floating turbidity barrier(s) including all necessary anchoring, buoys, marker lights, tow bridles and other accessories to contain and control the dispersion of silt, turbidity and displaced particles within the area of Work, or as required by ENGINEER.

1.02 Related Work Specified Elsewhere

- A. Section 01 1100: Summary of Work
- B. Section 01 2200: Unit Prices
- C. Section 01 3300: Submittal Procedures
- D. Section 31 2316: Structural Excavation and Backfill
- E. Section 31 2319: Dewatering
- F. Section 31 2333: Trenching and Backfilling

1.03 Responsibilities

- A. This is a performance specification. Except as otherwise specified or indicated, selection of equipment, materials, and methods shall be CONTRACTOR's responsibility and shall conform to all Federal, State, County and Local Regulations and permit conditions to contain and control the dispersion silt, turbidity and displaced particles generated during the performance of the Work which must be done.

1.04 Submittals

- A. The following submittals shall be made in accordance with Section 01 3300, Submittal Procedures:
 - 1. Turbidity Barrier:
 - a. Design of the barrier shall accommodate existing conditions within the river, including but not limited to water velocity, waves (height and frequency), as well as wind speed and direction.
 - b. Design of the barrier shall also take into account the silt, turbidity and displaced particles that may be generated during the Work, as well as project duration.
 - c. Contractor shall submit information on the length and depth of the barrier (s) to be installed, fabric type and color, flotation type, flotation size, tension cable size and location, ballast chain size and location, section connectors (if necessary), anchor type(s) and locations (spacing), installation method, and buoys and marker lighting used to ensure visibility of the barrier to those accessing or traveling the river.
 - (1) Permission to proceed must be received, prior to installation of the turbidity barrier.

(2) Furnishing of such information and receipt of permission to proceed shall not serve to relieve CONTRACTOR of its responsibility for the safety of the workers, the need to meet permit conditions, and the successful completion of the Work.

2. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.05 Quality Assurance

A. Installer Qualifications: Installer shall have ten (10) years' experience in the installation and maintenance of floating turbidity barrier s comparable to those proposed for this Work.

1.06 Delivery, Storage and Handling

A. Deliver materials specified herein to Project site in such quantities and at such times to ensure continuity of installation. Handle and store at the Project site to prevent physical damage.

Part 2 Products

2.01 General

- A. Floating turbidity barriers shall be Type II medium duty (MD) or Type II heavy duty (HD) permeable barriers comprised of 22 oz. PVC fabric with a UV inhibitor and a minimum tensile strength of 300 lbs.
- B. The barrier shall be furnished with galvanized cables, connectors, and anchoring system.
- C. The barrier shall be constructed with a minimum continuous space of 50 feet between joints, and not more than 100 feet between joints.
- D. Seams in the fabric shall be either vulcanized welded or sewn, and shall develop the full strength of the fabric.
- E. Floatation devices shall be flexible, buoyant units contained in an individual floatation sleeve or collar attached to the barrier. Buoyancy provided by the floatation units shall be sufficient to support the weight of the barrier and maintain a freeboard of at least 3 inches above the water surface level.
- F. Load lines must be fabricated into both the top and the bottom of all floating turbidity barrier s. The top load line shall consist of woven webbing or vinyl-sheathed steel cable and shall have a break strength in excess of 10,000 pounds. The supplemental (bottom) load- line shall consist of a chain incorporated into the bottom hem of the barrier of sufficient weight to serve as ballast to hold the barrier in a vertical position. Additional anchorage shall be provided as necessary. The load lines shall have suitable connecting devices which develop the full breaking strength for connecting to load lines in adjacent sections.
- G. Bottom anchors must be sufficient to hold the barrier in the same position relative to the bottom of the watercourse without interfering with the action of the barrier. The anchor may dig into the bottom or may be weighted and should be attached to a floating anchor buoy via an anchor line. The anchor line will run from the buoy to the top load line of the barrier.

Part 3 Execution

3.01 Performance

- A. CONTRACTOR shall furnish and install the floating turbidity barrier in accordance with the following:
 - 1. The layout and design of the connection, bracing and anchoring system for the turbidity barrier shall fully accommodate with appropriate factors of safety, based on river characteristics.
 - a. In rivers or in other moving water set the barrier anchor points to ensure they are of sufficient holding power to retain the barrier under the existing current conditions, prior to putting the furled barrier into the water.
 - b. Anchor buoys should be employed on all anchors to prevent the current from submerging the flotation at the anchor points.
 - 2. When the anchors are secure, the furled barrier should be secured to the upstream anchor point and then sequentially attached to each next downstream anchor point until the entire barrier is in position.
 - 3. Before unfurling, the "lay" of the barrier should be assessed and any necessary adjustments made to the anchors.
 - 4. When the final location of the turbidity barrier has been determined by CONTRACTOR, the furling lines should be cut to allow the skirt to drop.
 - 5. Attach anchor lines to the flotation device, not to the bottom of the barrier.

3.02 Maintenance

- A. CONTRACTOR shall be responsible for maintenance of the turbidity barrier for the duration of the Work in order to ensure the continuous protection of the watercourse.
- B. Should repairs to the barrier become necessary, repairs should be completed in accordance with manufacturer's recommendations and instruction to ensure the adequacy of the repair.

3.03 Removal

- A. When the turbidity barrier is no longer required as determined by ENGINEER, the barrier and its accessories and become the property of CONTRACTOR at the conclusion of the Work.
- B. The barrier shall be removed in such a manner as to minimize turbidity within the river. Remaining sediment shall be sufficiently settled before removing the barrier. Sediment may be removed and the original depth or plan elevation restored. Spoils are to be removed and disposed of by CONTRACTOR at an appropriate location.

End of Section

Exhibit I



Report of Geotechnical Investigation

**Existing Waterfront Park
Shelter**

**Jefferson Avenue
St. Clair Shores, Michigan**

Prepared for:

**Wade-Trim Associates
25251 Northline Road
Taylor, Michigan 48180**

**G2 Project No. 070183
March 26, 2007**



March 26, 2007

Mr. Bob Breen
Wade-Trim Associates
25251 Northline Road
Taylor, Michigan 48180

Re: Report on Geotechnical Investigation
Existing Waterfront Park Shelter
Jefferson Avenue
St. Clair Shores, Michigan
G2 Project No. 070183

Dear Mr. Breen:

We have completed the geotechnical investigation for the existing shelter at the Waterfront Park in St. Clair Shores, Michigan. This report presents the results of our observations and analyses and our recommendations for subgrade preparation, foundation design, and construction considerations as they relate to the geotechnical conditions at the site.

We appreciate the opportunity to be of service to Wade-Trim on this project and look forward to discussing the recommendations presented. In the meantime, if you have any questions regarding the report or any other matter pertaining to the project, please call us.

Sincerely,

G2 Consulting Group, LLC

A handwritten signature in blue ink that reads "Amy L. Schneider".

Amy L. Schneider, P.E.
Project Engineer

A handwritten signature in blue ink that reads "Noel J. Hargrave-Thomas".

Noel J. Hargrave-Thomas, P.E.
Project Manager

ALS/NJHT/als

Enclosures

Geotechnical & Geoenvironmental
Engineering Services
1866 Woodslee Street
Troy, Michigan 48083
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EXECUTIVE SUMMARY

The existing shelter present at the Waterfront Park in St. Clair Shores, Michigan consists of a roof supported by 10 poles and a slab present across the footprint of the shelter. No information regarding the foundations for support of the shelter or the slab cross-section is available at the time of this investigation. Visual distress of the slab is noticeable around the pole locations as well as across the entire slab. In addition, Wade-Trim has indicated the shelter is leaning toward the south. We understand current plans include demolition of the existing shelter and construction of a new shelter.

Approximately 14 inches of silty clay topsoil are present at the soil boring locations. Medium to stiff silty clay and sandy clay fill with 2.5 to 4.8 percent organic matter underlie the topsoil and extend to depths of 6-1/2 and 3 feet within borings B-1 and B-2, respectively. Native stiff sandy clay underlies the fill within boring B-2 and extends to an approximate depth of 6 feet. Native silty clay is present below the fill in boring B-1 and the sandy clay in boring B-2 and extends to the explored depth of 25 feet. The silty clay is generally soft to medium in consistency, decreasing in strength with depth. However, a layer of stiff silty clay is present within boring B-2 from an approximate depth of 6 to 9 feet. Groundwater was encountered at approximate depths of 13 and 5-1/2 feet within soil borings B-1 and B-2, respectively. Upon completion of drilling operations, the groundwater level was measured at depths of 10 and 8 feet.

We recommend the new shelter be supported on drilled pier foundations extending through the existing fill and bearing on the underlying native silty clay and sandy clay at depths ranging from 3 to 6-1/2 feet. We recommend a net allowable soil bearing capacity 1,000 pounds per square foot (psf) for foundations bearing on the native medium to stiff silty clay and sandy clay. Footings should bear at a minimum depth of 3-1/2 feet below finished grade for protection against frost heave. We recommend a G2 Consulting Group, LLC (G2) engineer be on site during construction to observe the excavations, measure the bearing depths, and verify the adequacy of the bearing soils.

We recommend the existing floor slab be removed and reconstructed. The existing subgrade consists of cohesive fill soils containing up to 4.8 percent organic matter. Cohesive soils are considered to be poor quality for direct support of floor slabs. However, we do not anticipate removal and replacement of these soils is economically feasible. Therefore, we recommend the existing cohesive subgrade be crowned to promote subsurface drainage. In addition, the grades should be raised with clean granular engineered fill to allow water to drain away from the slab perimeter, reduce the potential for concrete curling, and provide a separation from the slab and moisture sensitive subgrade. Floor slabs supported by the existing cohesive fill can be designed using a subgrade modulus of 100 pounds per cubic inch (pci). We recommend all concrete floor slabs be suitably reinforced and separated from the foundation system to allow for independent movement.

In general, we do not anticipate groundwater will be encountered within foundation excavations. We anticipate any surface run-off encountered within any excavations can be removed using properly constructed sumps.

This summary is not to be considered separate from the entire text of this report, with all the conclusions and qualifications mentioned herein. Details of our analysis and recommendations are discussed in the following sections and in the Appendix of this report.



PROJECT DESCRIPTION

The existing shelter present at the Waterfront Park in St. Clair Shores, Michigan consists of a roof supported by 10 poles. The poles appear to extend below grade. A slab is present across the footprint of the shelter. The slab is cut around the pole locations to allow for movement of the slab. No information regarding the foundations for support of the shelter or the slab is available at the time of this investigation.

We understand current plans include demolition of the existing shelter and construction of a new shelter. Visual distress of the slab is noticeable around the pole locations as well as across the entire slab. Around the poles, the concrete is cracked and has heaved in some areas and settled in others. In addition, cracking is visible across the slab within the footprint of the shelter. Based on information provided by Wade-Trim, the existing shelter is showing signs of distress and is leaning toward the south. At the time of our site visit, standing water and ice were present around the perimeter of the slab as well as across the slab. The areas of distress are presented within our Photographic Documentation, Plate Nos. 2 through 9.

SCOPE OF SERVICES

The field operations, laboratory testing, and engineering report preparation were performed under the direction and supervision of a licensed professional engineer. Our services were performed according to generally accepted standards and procedures in the practice of geotechnical engineering. Our scope of services for this project is as follows:

1. We drilled two soil borings adjacent to the existing shelter extending to a depth of 25 feet each.
2. We performed laboratory testing on representative samples obtained from the soil borings. Laboratory testing included visual engineering classification, natural moisture content, organic content (loss-on-ignition), dry density, and unconfined compressive strength determinations.
3. We prepared this engineering report. The report includes recommendations regarding foundation types, allowable bearing capacity, estimated settlement, slab construction, and construction considerations related to the structure.

FIELD OPERATIONS

Wade-Trim, in conjunction with G2, selected the number, depth, and location of the soil borings based on the location of the existing shelter. The soil boring locations were staked in the field by a representative of G2 by measuring from existing site features using conventional taping methods prior to drilling operations. The approximate soil boring locations are shown on the Soil Boring Location Plan, Plate No. 1. Ground surface elevations at the boring locations were not available at the time of this investigation.

Soil borings were drilled using an all-terrain vehicle (ATV) rotary drilling rig. Continuous flight 2-1/4 inch inside diameter, hollow-stem augers were used to advance the boreholes. Within each soil boring, soil samples were obtained at intervals of 2-1/2 feet within the upper 10 feet and at intervals of 5 feet below that depth. These samples were obtained by the Standard Penetration Test method ASTM D 1586,



which involves driving a 2-inch diameter split-spoon sampler into the soil with a 140-pound weight falling 30 inches. The sampler is generally driven three successive 6-inch increments with the number of blows for each increment recorded. The number of blows required to advance the sampler the last 12 inches is termed the Standard Penetration Resistance (N). The blow counts for each 6-inch increment and the resulting N-value are presented on the individual soil boring logs.

The soil samples were placed in sealed containers in the field and brought to the laboratory for testing and classification. During drilling operations, the drilling crew maintained logs of the encountered subsurface conditions, including changes in stratigraphy and observed groundwater levels of the soil borings to be used in conjunction with our analysis of the subsurface conditions. The final boring logs are based on the field logs and laboratory soil classification. After completion of the drilling operations, the boreholes were backfilled with the auger cuttings.

LABORATORY TESTING

Representative soil samples were subjected to laboratory testing to determine soil parameters pertinent for foundation design and site preparation. An experienced geotechnical engineer classified the samples in general conformance with the Unified Soil Classification System.

Laboratory testing included natural moisture content, organic content, dry density, and unconfined compressive strength determinations. The organic matter content of representative samples was determined in accordance with ASTM Test Method D 2974, "Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils". The unconfined compressive strengths were determined by ASTM Test Method D 2166 and using a spring loaded hand penetrometer. Per ASTM Test Method D 2166, the unconfined compressive strength of cohesive soils is determined by axially loading a small cylindrical soil sample under a slow rate of strain. The unconfined compressive strength is defined as the maximum stress applied to the soil sample before shear failure. If shear failure does not occur prior to a total strain of 15 percent, the unconfined compressive strength is defined as the stress at a total strain of 15 percent. The hand penetrometer estimates the unconfined compressive strength to a maximum of 4-1/2 tons per square foot (tsf) by measuring the resistance of the soil sample to the penetration of a calibrated spring loaded cylinder.

The results of the laboratory tests are indicated on the boring logs at the depths the samples were obtained. We will hold the soil samples for 60 days from the date of this report. If you would like the samples, please let us know.

SITE CONDITIONS

The existing shelter is located at the Waterfront Park in St. Clair Shores, Michigan. The park is located on the east side of Jefferson Avenue. The shelter is located within the northeast side of the park. The area directly surrounding the shelter is grass covered. Standing water was visible around the perimeter of the slab for the shelter as well as across the slab in several areas at the time of our investigation. Based on visual observations, the ground surface surrounding the shelter is flat and at the approximate elevation of the existing concrete slab.



A restroom facility is present south of the shelter. An existing asphalt drive extends from Jefferson Avenue to the restroom facility and a concrete sidewalk extends north to the shelter location. West of the shelter is a playground and athletic fields. North of the shelter, along the property line, is a tree line. Lake St. Clair extends along the east property line. Residential properties are present north and south of the park property.

SOIL CONDITIONS

Approximately 14 inches of silty clay topsoil are present at the soil boring locations. Silty clay and sandy clay fill with organic matter underlie the topsoil and extend to approximate depths of 6-1/2 and 3 feet within borings B-1 and B-2, respectively. Native sandy clay underlies the topsoil within boring B-2 and extends to an approximate depth of 6 feet. Native silty clay is present below the fill in boring B-1 and the sandy clay in boring B-2 and extends to the explored depth of 25 feet.

The silty clay fill is stiff in consistency with natural moisture contents of 19 and 28 percent, unconfined compressive strength tests of 2,000 psf, and organic contents of 3.1 and 2.5 percent. The sandy clay fill is medium in consistency with a natural moisture content of 30 percent, an unconfined compressive strength test of 1,000 psf, and an organic content of 4.8 percent. The native silty clay within boring B-2 extending to an approximate depth of 9 feet is stiff in consistency with a natural moisture content of 30 percent, a dry density of 90 pounds per cubic foot (pcf), and an unconfined compressive strength of 3,410 psf. The underlying silty clay is soft to medium in consistency with natural moisture contents ranging from 18 to 41 percent, dry densities of 90 and 95 pcf, and unconfined compressive strengths ranging from 500 to 1,860 psf.

The stratification depths shown on the soil boring logs represent the soil conditions at the boring locations. Variations may occur between borings. Additionally, the stratigraphic lines represent the approximate boundaries between soil types. The transitions may be more gradual than what are shown. We have prepared the boring logs on the basis of laboratory classification and testing as well as field logs of the soils encountered.

The Soil Boring Location Plan, Plate No. 1, Photographic Documentation, Plate Nos. 2 through 9, Soil Boring Logs, Figure Nos. 1 and 2, and Unconfined Compressive Strength Test, Figure No. 3, are presented in the Appendix. The soil profiles described above are generalized descriptions of the conditions encountered at the boring locations. General Notes Terminology defining the nomenclature used on the soil boring logs and elsewhere in this report are presented on Figure No. 4.

GROUNDWATER CONDITIONS

Groundwater was encountered at approximate depths of 13 and 5-1/2 feet within soil borings B-1 and B-2, respectively. Upon completion of drilling operations, the groundwater level was measured at depths of 10 and 8 feet.

Fluctuations in groundwater levels should be anticipated due to seasonal variations and following periods of prolonged precipitation. It should be noted that groundwater observations made during drilling operations in predominantly cohesive soils are not necessarily indicative of the static groundwater level.



This is due to the low permeability of such soils and the tendency of drilling operations to seal off the natural paths of groundwater flow.

SITE PREPARATION

Based on the existing conditions, we anticipate a moderate amount of earthwork will be required to construct the new shelter and slab. Earthwork operations are expected to consist of removing the existing slab, any associated base, and the existing shelter structure, preparing the subgrade for support of the new slab, and constructing the foundations for the new shelter. We recommend all earthwork operations be performed in accordance with comprehensive specifications and be properly monitored in the field by qualified geotechnical engineers and technicians.

At the start of earthwork operations, the existing slab, associated base, and existing structure must be completely removed within the limits of the proposed shelter footprint. Once the existing slab and structure have been removed, we recommend the cohesive subgrade be crowned to promote surface drainage. Additionally, the existing grades must be raised such that any accumulation of water will drain away from the shelter perimeter. Any cohesive soils that are disturbed during removal of existing slab should be removed and replaced with granular engineered fill. Prior to placement of any granular engineered fill, the exposed subgrade within the shelter footprint area should be thoroughly proof-rolled with a heavy roller and monitored by a qualified geotechnical engineer. Any unstable or unsuitable areas noted should be improved by additional compaction or removed and replaced with specified engineered fill.

Engineered fill should be free of organic matter, frozen soil, clods, or other harmful material. Engineered fill should be placed in uniform horizontal layers, not more than 9 inches in loose thickness. Engineered fill should be compacted to achieve a density of at least 95 percent of the maximum dry density as determined by the Modified Proctor compaction test (ASTM D 1557). All engineered fill material should be placed and compacted at approximately the optimum moisture content. Frozen material should not be used as fill, nor should fill be placed on a frozen subgrade.

FOUNDATION RECOMMENDATIONS

We recommend the shelter be supported on short drilled pier foundations extending through the existing fill and bearing on the underlying native silty clay and sandy clay. We recommend a net allowable soil bearing capacity 1,000 psf for foundations bearing on the native medium to stiff silty clay and sandy clay. Exterior footings should bear at a minimum depth of 3-1/2 feet below finished grade for protection against frost heave. We recommend a G2 engineer be on site during construction to observe the excavations, measure the bearing depths, and verify the adequacy of the bearing soils.

If the recommendations outlined in this report are adhered to, total and differential settlements for the completed structure should be within 1 inch and 1/2 inch, respectively. We expect settlements of these magnitudes are within tolerable limits for the type of structure proposed.



CONCRETE SLAB RECOMMENDATIONS

We recommend the existing concrete slab be removed and reconstructed. The existing subgrade consists of cohesive fill soils containing up to 4.8 percent organic matter. Cohesive soils are considered to be of poor quality for direct support of floor slabs. They have poor drainage characteristics, are susceptible to frost penetration, and have a moderate shrink/swell potential. However, we do not anticipate removal and replacement of these soils is economically feasible. Therefore, we recommend the existing cohesive subgrade be crowned and the grades be raised with granular engineered fill to promote drainage below and around the perimeter of the slab. The granular engineered fill placed to raise grades will aid in reducing the potential for concrete curling and provide a suitable separation from the slab and the moisture sensitive subgrade.

Floor slabs supported by the existing cohesive fill can be designed using a subgrade modulus of 100 pci. We recommend all concrete floor slabs be suitably reinforced and separated from the foundation system to allow for independent movement.

Ideally, raising the site to promote drainage should remove any water which accumulates below and around the perimeter of the slab. However, due to the existing soil conditions and the continued freeze/thaw cycles experienced within Michigan, similar results of the slab performance should be anticipated over time.

CONSTRUCTION CONSIDERATIONS

In general, we do not anticipate groundwater will be encountered within foundation excavations. We anticipate any surface run-off encountered within excavations can be removed using properly constructed sumps.

We anticipate the contractor can excavate foundations within open excavations within the existing cohesive soils. The sides of the foundations should be constructed straight and vertical to reduce the risk of frozen soil adhering to the concrete and raising the foundations.

All excavations should be safely sheeted, shored, sloped, or braced in accordance with MI-OSHA requirements. If material is stored or equipment is operated near an excavation, stronger shoring must be used to resist the extra pressure due to the superimposed loads. Care should always be exercised when excavating near existing structures to avoid undermining.

GENERAL COMMENTS

We have formulated the evaluations and recommendations presented in this report relative to site preparation and foundations on the basis of data provided to us relating to the location, type, and grade for the proposed site. Any significant change in this data should be brought to our attention for review and evaluation with respect to the prevailing subsurface conditions. If changes occur in the design, location, or concept of the project, the conclusions and recommendations contained in this report are not valid unless G2 Consulting Group, LLC reviews the changes. G2 Consulting Group, LLC will then confirm the recommendations presented herein or make changes in writing.



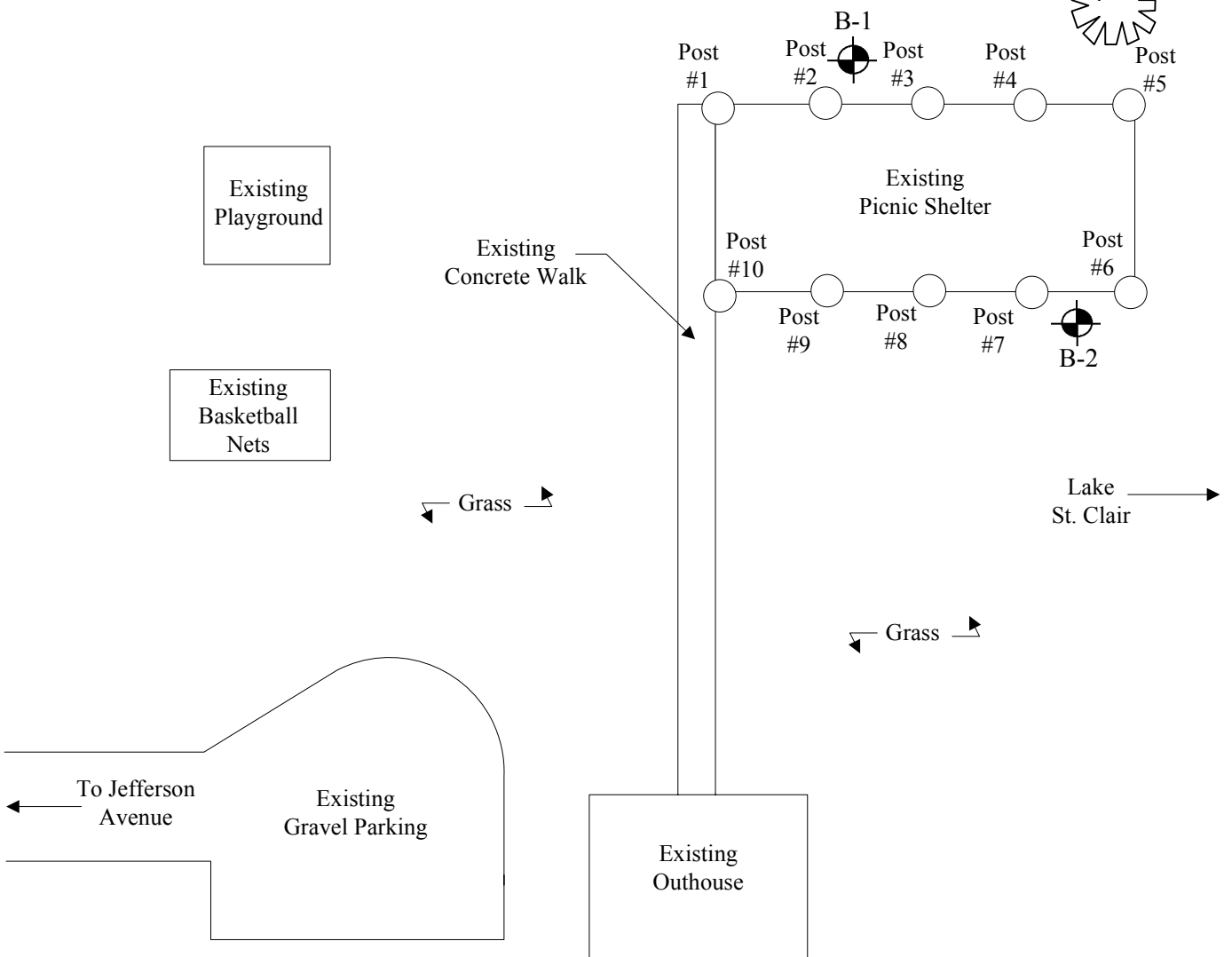
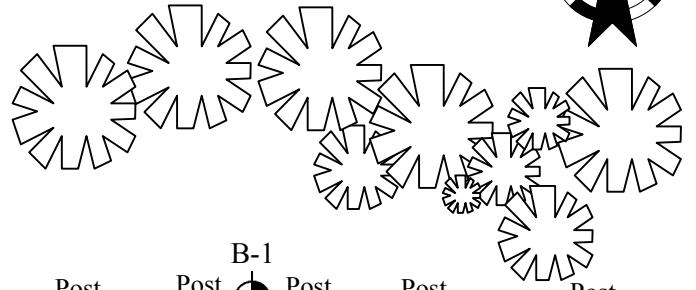
The scope of the present investigation was limited to evaluation of subsurface conditions for the support of the shelter foundation and other related aspects of the development. No chemical, environmental, or hydrogeological testing or analyses were included in the scope of this investigation.

We have based the analyses and recommendations submitted in this report upon the data from soil borings performed at the approximate locations shown on the Soil Boring Location Plan, Plate No. 1. This report does not reflect variations that may occur between the actual soil boring locations and the actual structure location. The nature and extent of any such variations may not become clear until the time of construction. If significant variations then become evident, it may be necessary for us to re-evaluate our report recommendations.

Soil conditions at the site could vary from those generalized on the basis of soil borings made at specific locations. It is, therefore, recommended that G2 Consulting Group, LLC be retained to provide soil engineering services during the site preparation, excavation, and foundation construction phases of the proposed project. This is to observe compliance with the design concepts, specifications, and recommendations. Also, this allows design changes to be made in the event that subsurface conditions differ from those anticipated prior to the start of construction.

APPENDIX

Soil Boring Location Plan	Plate No. 1
Photographic Documentation	Plate Nos. 2 through 9
Soil Boring Logs	Figure Nos. 1 and 2
Unconfined Compressive Strength Test	Figure No. 3
General Notes Terminology	Figure No. 4



Legend

 Soil Boring Drilled by Strata Drilling on March 19, 2007

Soil Boring Location Plan

Waterfront Park Existing Shelter
 Jefferson Avenue
 Harrison Township, Michigan



Project No. 070183

Drawn by: KML

Date: 03/09/07

Scale: NTS

Plate No. 1

**Photographic Documentation
Existing Waterfront Park Shelter
St. Clair Shores, Michigan
G2 Project No. 070183**



Photograph No. 1: Looking north at shelter.



Photograph No. 2: Looking north at post #7. Notice heaving and cracking of slab around the pole.

**Photographic Documentation
Existing Waterfront Park Shelter
St. Clair Shores, Michigan
G2 Project No. 070183**



Photograph No. 3: Looking north at post #6. Note settlement and cracking of slab around the pole.



Photograph No. 4: Looking north at post #9. Note settlement and cracking of slab around the pole and cracking of slab within shelter footprint. Also, note standing water around perimeter of slab.

**Photographic Documentation
Existing Waterfront Park Shelter
St. Clair Shores, Michigan
G2 Project No. 070183**



Photograph No. 5: Looking north at post #8. Note standing water around perimeter of slab, cracking of slab around pole, and cracking of slab within shelter footprint.



Photograph No. 6: Looking north at post #10. Note standing water around perimeter of slab and cracking of slab around pole.

**Photographic Documentation
Existing Waterfront Park Shelter
St. Clair Shores, Michigan
G2 Project No. 070183**



Photograph No. 7: Looking south at post #5. Note standing water and ice around perimeter of slab.



Photograph No. 8: Looking south at post #4. Note standing water and ice around perimeter of slab as well across the overall slab.

**Photographic Documentation
Existing Waterfront Park Shelter
St. Clair Shores, Michigan
G2 Project No. 070183**



Photograph No. 9: Looking south at post #3. Note standing water and ice around perimeter of slab and across slab and cracking and heaving of slab around pole.



Photograph No. 10: Looking south at post #2. Note standing water and ice around perimeter of slab and across the slab and cracking of slab around pole.

**Photographic Documentation
Existing Waterfront Park Shelter
St. Clair Shores, Michigan
G2 Project No. 070183**



Photograph No. 11: Looking north at post #1. Note cracking and heaving of slab around pole.



Photograph No. 12: Looking south at the shelter.

**Photographic Documentation
Existing Waterfront Park Shelter
St. Clair Shores, Michigan
G2 Project No. 070183**



Photograph No. 13: Looking west at post #5.



Photograph No. 14: Looking west at shelter.

**Photographic Documentation
Existing Waterfront Park Shelter
St. Clair Shores, Michigan
G2 Project No. 070183**



Photograph No. 15: Looking west at post #6. Note standing water and ice around perimeter of slab and cracking of slab around pole.



Photograph No. 16: Looking west at shelter.

Project Name: Existing Waterfront Park Shelter

Project Location: Jefferson Avenue
St. Clair Shores, Michigan

G2 Project No. 070183

Checked By:

Soil Boring No. B-1



Consulting Group, LLC

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE/NO.	BLOWS/ (6-INCHES)	STD. PEN RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCOF. COMP. ST. (PSF)
		Topsoil: Dark Brown Silty Clay	1.2		2				
		Fill: Stiff Dark Brown and Brown Silty Clay with trace silt and organic matter (Organic Content = 3.1%)	3.0	S-1	3 4	7	19.4		2000*
5		Fill: Stiff Mottled Brown Silty Clay with trace sand and sand partings (Organic Content = 2.5%)	5	S-2	2 3 3	6	28.2		2000*
		Medium Gray Silty Clay with trace sand and gravel	6.5	S-3	4 4 4	8	37.0	90	1860
			8.5						
10			10	S-4	3 3 3	6	41.3		
		Soft Gray Silty Clay with trace sand and gravel							
15			15	S-5	1 2 2	4	39.3		
20			20	S-6	2 2 2	4	37.8		
25			25.0	S-7	2 3 4	7	18.0		500*
		End of Boring @ 25ft							
30			30						

Total Depth: 25ft
 Drilling Date: March 19, 2007
 Inspector:
 Contractor: Strata Drilling, Inc.
 Driller: N. Bower

Water Level Observation:
 13 feet during drilling; 10 feet upon completion

Notes:
 * Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
 Borehole backfilled with auger cuttings

Drilling Method:
 2-1/4 inch inside diameter hollow stem augers

Figure No. 1

SOIL / PAVEMENT BORING_070183.GPJ G2_CONS.GDT 3/26/07

Project Name: Existing Waterfront Park Shelter

Soil Boring No. **B-2**

Project Location: Jefferson Avenue
St. Clair Shores, Michigan



G2 Project No. 070183

Checked By:

Consulting Group, LLC

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE/NO.	BLOWS/ (6-INCHES)	STD. PEN RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCOF. COMP. ST. (PSF)
		Topsoil: Dark Brown Silty Clay	1.2		1				
		Fill: Medium Dark Brown Sandy Clay with trace silt and organic matter (Organic Content = 4.8%)	3.0	S-1	2 4	6	29.6		1000*
5		Stiff Brown and Gray Sandy Clay with trace silt	5	S-2	2 2 3	5	24.3	111	1150
		Stiff Brown Silty Clay with trace sand	6.0		3				
		Stiff Brown Silty Clay with trace sand	9.0	S-3	4 5	9	29.8	95	3410
10		Stiff Brown Silty Clay with trace sand	10	S-4	3 4 4	8	35.5	90	1360
15		Soft to Medium Gray Silty Clay with trace sand and gravel	15	S-5	2 2 3	5	31.6		500*
20		Soft to Medium Gray Silty Clay with trace sand and gravel	20	S-6	2 2 2	4	34.5		
25		Soft to Medium Gray Silty Clay with trace sand and gravel	25.0	S-7	2 2 3	5	27.2		500*
		End of Boring @ 25ft							
30			30						

Total Depth: 25ft
 Drilling Date: March 19, 2007
 Inspector:
 Contractor: Strata Drilling, Inc.
 Driller: N. Bower

Water Level Observation:
 5-1/2 feet during drilling; 8 feet upon completion

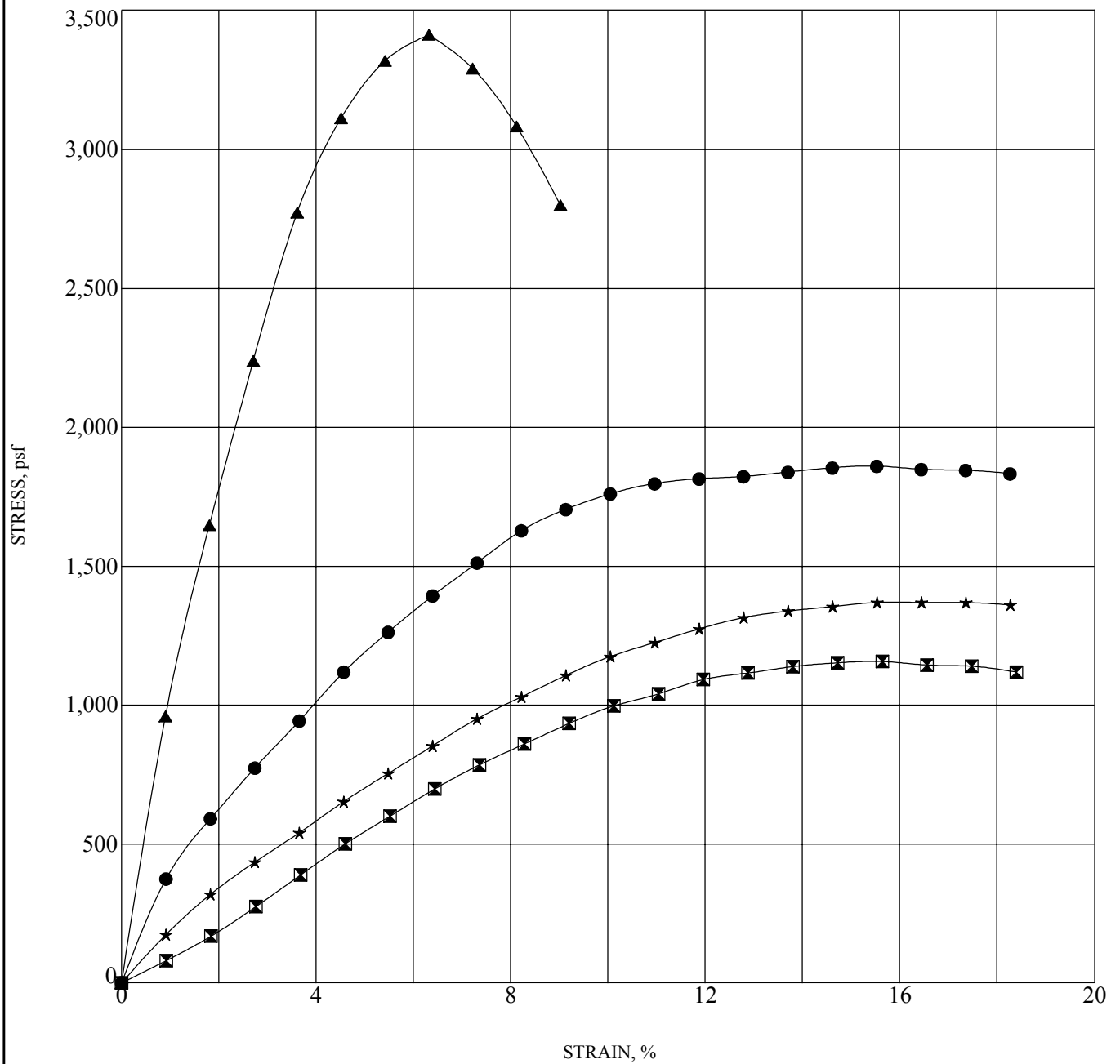
Notes:
 * Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
 Borehole backfilled with auger cuttings

Drilling Method:
 2-1/4 inch inside diameter hollow stem augers

Figure No. 2

SOIL / PAVEMENT BORING_070183.GPJ G2_CONS.GDT 3/26/07



Specimen	Classification	MC%	γ_d	UC
● B-1 S-3	Gray Silty Clay	37	90	1860
■ B-2 S-2	Brown and Gray Sandy Clay	24	111	1150
▲ B-2 S-3	Brown Silty Clay	30	95	3410
★ B-2 S-4	Gray Silty Clay	36	90	1360

UNCONFINED COMPRESSIVE STRENGTH TEST

Project Name: Existing Waterfront Park Shelter

Project Location: Jefferson Avenue
St. Clair Shores, Michigan

G2 Project No.: 070183

Figure No. 3



Unless otherwise noted, all terms herein refer to the Standard Definitions presented in ASTM 653.

PARTICLE SIZE		CLASSIFICATION
Boulders	- greater than 12 inches	The major soil constituent is the principal noun, i.e. clay, silt, sand, gravel. The second major soil constituent and other minor constituents are reported as follows:
Cobbles	- 3 inches to 12 inches	
Gravel	- Coarse - 3/4 inches to 3 inches	Second Major Constituent (percent by weight)
	- Fine - No. 4 to 3/4 inches	
Sand	- Coarse - No. 10 to No. 4	Minor Constituent (percent by weight)
	- Medium - No. 40 to No. 10	
	- Fine - No. 200 to No. 40	
Silt	- 0.005mm to 0.074mm	Trace - 1 to 12%
Clay	- Less than 0.005mm	Adjective - 12 to 35%
		And - over 35%
		Trace - 1 to 12%
		Little - 12 to 23%
		Some - 23 to 33%

COHESIVE SOILS

If clay content is sufficient so that clay dominates soil properties, clay becomes the principal noun with the other major soil constituent as modifier, i.e. sandy clay. Other minor soil constituents may be included in accordance with the classification breakdown for cohesionless soils, i.e. silty clay, trace sand, little gravel.

Consistency	Unconfined Compressive Strength (psf)	Approximate Range of (N)
Very Soft	Below 500	0 - 2
Soft	500 - 1,000	3 - 4
Medium	1,000 - 2,000	5 - 8
Stiff	2,000 - 4,000	9 - 15
Very Stiff	4,000 - 8,000	16 - 30
Hard	8,000 - 16,000	31 - 50
Very Hard	Over 16,000	Over 50

Consistency of cohesive soils is based upon an evaluation of the observed resistance to deformation under load and not upon the Standard Penetration Resistance (N).

COHESIONLESS SOILS		
Density Classification	Relative Density %	Approximate Range of (N)
Very Loose	0 - 15	0 - 4
Loose	16 - 35	5 - 10
Medium Compact	36 - 65	11 - 30
Compact	66 - 85	31 - 50
Very Compact	86 - 100	Over 50

Relative Density of cohesionless soils is based upon the evaluation of the Standard Penetration Resistance (N), modified as required for depth effects, sampling effects, etc.

SAMPLE DESIGNATIONS

- AS - Auger Sample – Cuttings directly from auger flight
- BS - Bottle or Bag Samples
- S - Spilt Spoon Sample - ASTM D 1586
- LS - Liner Sample with liner insert 3 inches in length
- ST - Shelby Tube sample - 3 inch diameter unless otherwise noted
- PS - Piston Sample - 3 inch diameter unless otherwise noted
- RC - Rock Core - NX core unless otherwise noted

STANDARD PENETRATION TEST (ASTM D 1586) - A 2.0 inch outside-diameter, 1-3/8 inch inside-diameter split barrel sampler is driven into undisturbed soil by means of a 140-pound weight falling freely through a vertical distance of 30 inches. The sampler is normally driven three successive 6-inch increments. The total number of blows required for the final 12 inches of penetration is the Standard Penetration Resistance (N).



**MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
WATER RESOURCES DIVISION
PERMIT**

Issued To:

**Kenneth Verkest
38151 Lanse Cruese St.
Harrison Twp., MI 48045**

**Permit No: WRP038386 v.1
Submission No.: HPR-3JZ6-T3H4M
Site Name: 50-34890 Jefferson Ave-Harrison Charter Twp
Issued: July 31, 2023
Revised:
Expires: July 31, 2028**

This permit is being issued by the Michigan Department of Environment, Great Lakes, and Energy (EGLE), Water Resources Division, under the provisions of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA); specifically:

- | | |
|---|--|
| <input type="checkbox"/> Part 301, Inland Lakes and Streams | <input type="checkbox"/> Part 323, Shorelands Protection and Management |
| <input type="checkbox"/> Part 303, Wetlands Protection | <input checked="" type="checkbox"/> Part 325, Great Lakes Submerged Lands |
| <input type="checkbox"/> Part 315, Dam Safety | <input type="checkbox"/> Part 353, Sand Dunes Protection and Management |
| <input type="checkbox"/> Part 31, Water Resources Protection (Floodplain Regulatory Authority) | |

EGLE certifies that the activities authorized under this permit are in compliance with the State Coastal Zone Management Program and certifies without conditions under the Federal Clean Water Act, Section 401 that the discharge from the activities authorized under this permit will comply with Michigan's water quality requirements in Part 31, Water Resources Protection, of the NREPA and associated administrative rules, where applicable.

Permission is hereby granted, based on permittee assurance of adherence to State of Michigan requirements and permit conditions, to:

Authorized Activity:

Place 564 cubic yards of stone riprap along 280 feet of shoreline below the ordinary high-water mark (OHWM) of 575.3 feet. Excavate 763 cubic yards of material below the OHWM and replace with toestone. Construct a kayak launch with precast concrete. Construct a permanent 10 feet wide by 105 feet long, elevated, open pile pier with an 18 feet wide by 30 feet long fishing platform.

No work or dredging within the water authorized by this permit is allowed from April 1 to September 30 any year this permit is valid due to critical spawning, migration, and/or recreational use periods.

All work shall be completed in accordance with the attached modified plans and the terms and conditions of this permit.

Waterbody Affected: Lake St. Clair

Property Location: Macomb County, Harrison Township, Property Tax No. 11-36-276-015

Authority granted by this permit is subject to the following limitations:

- A. Initiation of any work on the permitted project confirms the permittee's acceptance and agreement to comply with all terms and conditions of this permit.
- B. The permittee, in exercising the authority granted by this permit, shall not cause unlawful pollution as defined by Part 31 of the NREPA.
- C. This permit shall be kept at the site of the work and available for inspection at all times during the duration of the project or until its date of expiration.
- D. All work shall be completed in accordance with the approved plans and specifications submitted with the application and/or plans and specifications attached to this permit.
- E. No attempt shall be made by the permittee to forbid the full and free use by the public of public waters at or adjacent to the structure or work approved.
- F. It is made a requirement of this permit that the permittee give notice to public utilities in accordance with 2013 PA 174 (Act 174) and comply with each of the requirements of Act 174.
- G. This permit does not convey property rights in either real estate or material, nor does it authorize any injury to private property or invasion of public or private rights, nor does it waive the necessity of seeking federal assent, all local permits, or complying with other state statutes.
- H. This permit does not prejudice or limit the right of a riparian owner or other person to institute proceedings in any circuit court of this state when necessary to protect his rights.
- I. Permittee shall notify EGLE within one week after the completion of the activity authorized by this permit by completing and forwarding the attached preaddressed postcard to the office addressed thereon.
- J. This permit shall not be assigned or transferred without the written approval of EGLE.
- K. Failure to comply with conditions of this permit may subject the permittee to revocation of permit and criminal and/or civil action as cited by the specific state act, federal act, and/or rule under which this permit is granted.
- L. All dredged or excavated materials shall be disposed of in an upland site (outside of floodplains, unless exempt under Part 31 of the NREPA, and wetlands).
- M. In issuing this permit, EGLE has relied on the information and data that the permittee has provided in connection with the submitted application for permit. If, subsequent to the issuance of a permit, such information and data prove to be false, incomplete, or inaccurate, EGLE may modify, revoke, or suspend the permit, in whole or in part, in accordance with the new information.
- N. The permittee shall indemnify and hold harmless the State of Michigan and its departments, agencies, officials, employees, agents, and representatives for any and all claims or causes of action arising from acts or omissions of the permittee, or employees, agents, or representative of the permittee, undertaken in connection with this permit. The permittee's obligation to indemnify the State of Michigan applies only if the state: (1) provides the permittee or its designated representative written notice of the claim or cause of action within 30 days after it is received by the state, and (2) consents to the permittee's participation in the proceeding on the claim or cause of action. It does not apply to contested case proceedings under the Administrative Procedures Act, 1969 PA 306, as amended, challenging the permit. This permit shall not be construed as an indemnity by the State of Michigan for the benefit of the permittee or any other person.
- O. Noncompliance with these terms and conditions and/or the initiation of other regulated activities not specifically authorized shall be cause for the modification, suspension, or revocation of this permit, in whole or in part. Further, EGLE may initiate criminal and/or civil proceedings as may be

deemed necessary to correct project deficiencies, protect natural resource values, and secure compliance with statutes.

- P. If any change or deviation from the permitted activity becomes necessary, the permittee shall request, in writing, a revision of the permitted activity from EGLE. Such revision request shall include complete documentation supporting the modification and revised plans detailing the proposed modification. Proposed modifications must be approved, in writing, by EGLE prior to being implemented.
- Q. This permit may be transferred to another person upon written approval of EGLE. The permittee must submit a written request to EGLE to transfer the permit to the new owner. The new owner must also submit a written request to EGLE to accept transfer. The new owner must agree, in writing, to accept all conditions of the permit. A single letter signed by both parties that includes all the above information may be provided to EGLE. EGLE will review the request and, if approved, will provide written notification to the new owner.
- R. Prior to initiating permitted construction, the permittee is required to provide a copy of the permit to the contractor(s) for review. The property owner, contractor(s), and any agent involved in exercising the permit are held responsible to ensure that the project is constructed in accordance with all drawings and specifications. The contractor is required to provide a copy of the permit to all subcontractors doing work authorized by the permit.
- S. Construction must be undertaken and completed during the dry period of the wetland. If the area does not dry out, construction shall be done on equipment mats to prevent compaction of the soil.
- T. Authority granted by this permit does not waive permit requirements under Part 91, Soil Erosion and Sedimentation Control, of the NREPA, or the need to acquire applicable permits from the County Enforcing Agent (CEA).
- U. Authority granted by this permit does not waive permit requirements under the authority of Part 305, Natural Rivers, of the NREPA. A Natural Rivers Zoning Permit may be required for construction, land alteration, streambank stabilization, or vegetation removal along or near a natural river.
- V. The permittee is cautioned that grade changes resulting in increased runoff onto adjacent property is subject to civil damage litigation.
- W. Unless specifically stated in this permit, construction pads, haul roads, temporary structures, or other structural appurtenances to be placed in a wetland or on bottomland of the water body are not authorized and shall not be constructed unless authorized by a separate permit or permit revision granted in accordance with the applicable law.
- X. For projects with potential impacts to fish spawning or migration, no work shall occur within fish spawning or migration timelines (i.e., windows) unless otherwise approved in writing by the Michigan Department of Natural Resources, Fisheries Division.
- Y. Work to be done under authority of this permit is further subject to the following special instructions and specifications:
1. Authority granted by this permit does not waive permit or program requirements under Part 91 of the NREPA or the need to acquire applicable permits from the CEA. To locate the Soil Erosion Program Administrator for your county, visit <https://www.michigan.gov/egle/about/organization/water-resources/soil-erosion/sesc-overview> and select "Soil Erosion and Sedimentation Control Agencies".
 2. The authority to conduct the activity as authorized by this permit is granted solely under the provisions of the governing act as identified above. This permit does not convey, provide, or otherwise imply approval of any other governing act, ordinance, or regulation, nor does it waive the permittee's obligation to acquire any local, county, state, or federal approval or authorization necessary to conduct the activity.

3. No fill, excess soil, or other material shall be placed in any wetland, floodplain, or surface water area not specifically authorized by this permit, its plans, and specifications.
4. This permit does not authorize or sanction work that has been completed in violation of applicable federal, state, or local statutes.
5. The permit placard shall be kept posted at the work site in a prominent location at all times for the duration of the project or until permit expiration.
6. This permit is being issued for the maximum time allowed and no extensions of this permit will be granted. Initiation of the construction work authorized by this permit indicates the permittee's acceptance of this condition. The permit, when signed by EGLE, will be for a five-year period beginning on the date of issuance. If the project is not completed by the expiration date, a new permit must be sought.
7. If the language in the permitted activity box ever contradicts the approved drawings, the language in the permitted activity box shall supersede the site plans and cross-sectional drawings. The permittee shall contact EGLE for clarification.

Riprap

8. Prior to commencing installation of the shore protection structure, the entire waterward perimeter of project site shall be isolated with a turbidity curtain to prevent movement of suspended sediments. The turbidity curtain shall be installed to extend from the bed of the waterbody to a point above the existing water's surface. The turbidity curtain shall be maintained for the duration of the project and shall be left in place after completion until all disturbed sediments have settled.
9. All raw areas in uplands resulting from the permitted construction activity shall be effectively stabilized with sod and/or seed and mulch (or other technology specified by this permit or project plans) in a sufficient quantity and manner to prevent erosion and any potential siltation to surface waters or wetlands. Temporary stabilization measures shall be installed before or upon commencement of the permitted activity, and shall be maintained until permanent measures are in place. Permanent measures shall be in place within five (5) days of achieving final grade.
10. All riprap shall be properly sized based on wave action and velocity, and shall consist of natural field stone or rock (free of paint, soil or other fines, asphalt, soluble chemicals, or organic material). **Broken concrete is not allowed.**
11. The placement of riprap as proposed does not establish a new shoreline nor shall it be construed to do so. The riprap is authorized as a protective structure placed for the explicit purpose of protecting the shoreline at the landward side of the riprap. Consideration of any future construction shall be based on the shoreline existing prior to riprap placement as authorized by this permit.
12. Upon completion of your project, you must complete and return the enclosed card and photos points showing the "as-built" condition of your project.


13. The completion card and required photos shall be uploaded to MiEnviro or forwarded to EGLE's Water Resources Division, Warren District Office, within 30 days of completion of the project. Staff will use such pictures for monitoring compliance with your permit. Failure to submit these photos is an event of noncompliance.
14. All fill/backfill shall consist of clean inert material which will not cause siltation nor contain soluble chemicals, organic matter, pollutants, or contaminants. All fill shall be contained in such a manner so as not to erode into any surface water, floodplain, or wetland. All raw areas associated with the permitted activity shall be stabilized with sod and/or seed and mulch, riprap, or other technically effective methods as necessary to prevent erosion.

Pier

15. Dock(s) or pier(s) shall be of open construction without fill, maintaining free water movement and circulation.
16. The dock must be located such that boat dockage shall not interfere with riparian rights.
17. Additional attachments to permitted structures, including but not limited to roofs, sidewalls, decks, docks, piers, or extensions thereof, are not authorized by this permit.
18. Filling is not authorized by this permit.

Dredging

19. Dredged material, including organic and inorganic sediment, vegetation, and other material removed from bottomlands, shall not be placed in any wetland, floodplain or critical dune, or below the ordinary high-water mark of any inland lake, Great Lake, or stream. Dredged material placed on upland shall be stabilized in such a manner to prevent erosion of any material into any waterbody, including wetlands, or floodplain.
20. The permittee is cautioned that excessive dredging resulting in the impairment of the structural integrity of seawalls on neighboring riparian properties is subject to civil damage litigation.
21. **No work or dredging within the water authorized by this permit is allowed from April 1 to September 30 any year this permit is valid due to critical spawning, migration, and/or recreational use periods.**
22. In issuing this permit, EGLE has relied on the information and data, which the permittee has provided in connection with the permit application. If, subsequent to the issuance of this permit, such information and data prove to be false, incomplete, or inaccurate, or additional information demonstrates that the spoils are causing environmental contamination, or that new State or Federal regulations are promulgated which cause this disposal to be inappropriate, EGLE may modify, revoke, or suspend the permit, in whole or in part, in accordance with the new information.
23. Any questions on disposal of material under Part 115 Solid Waste Management should be forwarded to EGLE's Materials Management Division EGLE-MMD-BeneficialUseProgram@michigan.gov

Issued By: 
Erica Volansky
Warren District Office
Water Resources Division
586-601-7985

THIS PERMIT MUST BE SIGNED BY THE PERMITTEE TO BE VALID.

I hereby assure that I have read, am familiar with, and agree to adhere to the terms and conditions of this permit.

Permittee Signature

Date

cc: Harrison Township Clerk
Macomb County CEA
USACE
EGLE MMD
Matthew Clark, Agent

DEPARTMENT OF THE ARMY PERMIT

Permittee Charter Township of Harrison

Permit No. LRE-2020-00753-10

Issuing Office U.S. Army Engineer District, Detroit

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description:

Install an approximately 430-foot long silt curtain to enclose the proposed work area; mechanically dredge approximately 320 cubic yards of material from a 320-foot long by 5-foot wide area to shape and prepare area for placement of a stone revetment; disconnect and remove approximately 250 linear feet of top plate of seawall; cut away and remove approximately 840 square feet of seawall at lower revetment locations to allow lake water to access proposed marsh area; extend an existing 36-inch diameter stormwater outfall structure approximately 40-feet waterward to edge of proposed riprap; install approximately 973 cubic yards of stone riprap to create a 280-foot long by 17-foot wide stone revetment; construct a 30-foot long by 8-foot wide wooden fishing platform on top of the central stone revetment; excavate approximately 960 cubic yards of material to facilitate the construction of low and high marsh areas waterward of the existing seawall and proposed revetment; plant the shoreline edge to facilitate development of vegetated marsh areas; dredge and grade approximately 40 cubic yards of material to facilitate construction of a kayak launch; construct a 10-foot by 24-foot, concrete plank kayak launch; and install approximately 70 cubic yards of outcropping stone within the revetment to create 8-foot long by 4-foot wide stone steps down to the lake at the south end of the site.

Project Location:

In Lake St. Clair, offshore property in 34890 Jefferson Ave, Harrison Township, Michigan.

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on **December 31, 2023**. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.
2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this

office, which may require restoration of the area.

3. If you discover any unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately stop work in that area and notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.
4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.
5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.
6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

1. Your signature, as permittee, indicates that, as consideration for the issuance of this permit, you voluntarily accept and agree to comply with all of the terms and conditions of this permit.
2. The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.
3. All dredged and/or excavated materials will be disposed of in upland location(s) landward of the Ordinary High Water Mark with no placement in, or return to, any waterway or wetland.
4. All dredging is prohibited during the period April 1 through June 30, as designated in the issued Michigan Department of Environment, Great Lakes, and Energy (EGLE) permit. If the EGLE modifies the dredge window, the permittee must provide a copy of such modification to the Corps of Engineers prior to the start of dredging.
5. All fill shall consist of clean, inert materials from an upland source. The fill material must be free from toxic substances, fines, oil and grease, debris, wood, general refuse, plaster, and other pollutants, and shall contain no broken asphalt, oil-based material, or metal.
6. Prior to beginning any dredging, the permittee shall install commercial-grade silt curtains that extend from a floating boom on the lake surface down to the bed of the waterway. The silt curtain shall continuously and completely enclose the dredge area. The silt curtain shall be properly anchored onshore, and anchored offshore at 25-foot intervals to provide a stable and functional barrier. The silt curtain shall be maintained in effective working condition until all dredging is completed and turbidity has returned to background levels. In the event that the silt curtain remains in place overnight, the applicant will coordinate proper marking of the silt

curtain with the USCG and their requirements (e.g. lighting, reflective paints, etc.) will become special conditions under this permit.

7. Upon completion of earthwork operations, all exposed slopes, fills, and disturbed areas must be given sufficient protection by appropriate means such as landscaping or planting and maintaining vegetative cover to prevent subsequent erosion.

Further Information:

1. Congressional Authorities: You have been so authorized to undertake the activity described above pursuant to:

Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act.

2. Limits of this authorization.

- a. This permit does not obviate the need to obtain Federal, state, or local authorizations required by law.
- b. This permit does not grant any property rights or exclusive privileges.
- c. This permit does not authorize any injury to the property or rights of others.
- d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

- a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.
- b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.
- c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.
- d. Design or construction deficiencies associated with the permitted work.
- e. Damage claims associated with any future modifications, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance of the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

- a. You fail to comply with the terms and conditions of this permit.
- b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).
- c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR



GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
WARREN



PHILLIP D. ROOS
DIRECTOR

January 22, 2024

Kenneth Verkest
38151 L'Anse Creuse
Harrison Township, MI 48045

Dear Kenneth Verkest:

SUBJECT: Michigan Department of Environment, Great Lakes, and Energy (EGLE)
WRP038386 v. 1
Harrison Township Waterfront Park, Macomb County, Property Tax No. 11-36-276-015

We received your letter dated December 1, 2023, requesting a minor revision for work authorized by EGLE Permit Number WRP038386.

This letter authorizes revision of your EGLE Permit Number WRP038386 to move the fishing pier to the north and shorten the dock by 15 feet.

You are reminded that all conditions as set forth in the original permit remain in full force. This letter must be attached to your permit and kept at the site of the work, available for inspection at all times during the duration of the project or until the date of expiration. This revision does not obviate the need for other federal, state, and/or local permits as may be required by law.

If you have any questions regarding this letter, please contact me at 586-601-7985; VolanskyE@michigan.gov; or EGLE, Water Resources Division, Warren District Office, 27700 Donald Court, Warren, MI, 48092-2793. Please include your Permit Number WRP038386 in your response.

Sincerely,

Erica Volansky
Water Resources Division

cc: Matthew Clark, Wade Trim
Macomb County CEA
Lucas Shea, USACE