SECTION 00 01 00
CONTRACT DOCUMENTS

2025-2026 SIDEWALK AND PAVEMENT REPAIR PROGRAM

City of Ecorse
3869 W. Jefferson Ave
Ecorse, MI 48229

October 2, 2025

25251 Northline Rd, Taylor, MI 48180

ECO 2004-02T

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END OF SECTION

SECTION 00 11 13
ADVERTISEMENT FOR BIDS

2025-2026 Sidewalk and Pavement Repair Program

City of Ecorse has utilized **MITN Purchasing Group(MITN)** to view and download the plans and specifications for this project.

Sealed Bids will be received by City of Ecorse at the Clerk's Office, 3869 W Jefferson Ave, Ecorse MI, 48229 until 10:00 A.M., Local Time, 10/28/2025, at which time and place said Bids will be opened and publicly read aloud.

Bids will be received for the following as needed items of work, including approximately 2000 SFT of 4 inch sidewalk, 2000 SFT of 6 inch sidewalk, 1000 SYD of pavement removal, with 500 SYD of 8 inch concrete pavement, and 500 SYD of 9 inch concrete pavement, aggregate base and other related work. The location and limits of work will be directed by the Engineer.

Contract Documents may be examined at the following locations:

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

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

Contract Documents for bidding purposes are only available from Bidnet/MITN starting on October 2, 2025.

A. There is no cost for downloading the Contract Documents in pdf format. Bidders must download the Documents from bidnet/MITN to be included on the Plan Holders List and to receive any Addenda posted for the project.

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

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

Bids may not be withdrawn for the period of 60 days after date of receiving bids.

Inquiries will be directed to Wade Trim (734) 947-9700, Engineer at Phone: (734) 395-8064 or email: bfrisk@wadetrim.com.

SECTION 00 21 13 - INSTRUCTIONS TO BIDDERS

PART 1 GENERAL

1.01 DEFINED TERMS

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

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

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

D. The term "Owner" means City of Ecorse, 3869 W. Jefferson Ave, a Municipal Corporation and being a party of the first part of this Contract.

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

1.02 BIDDERS QUALIFICATIONS

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

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

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

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

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

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

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

1.03 EXAMINATION OF CONTRACT DOCUMENTS AND SITE

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

1. Examine the Contract Documents thoroughly,

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

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

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

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

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

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

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

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

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

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

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

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

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

Engineer is acceptable to Bidder, and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performing and furnishing the Work, and that the time stated in the Proposal is sufficient to complete the project.

1.04 INTERPRETATIONS AND ADDENDA

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

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

1.05 BID SECURITY

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

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

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

1.06 CONTRACT TIME

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

1.07 SUBSTITUTE AND “OR-EQUAL” ITEMS

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

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

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

1.08 RECEIPT AND FORM OF BID

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

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

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

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

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

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

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

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

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

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

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

1.09 MODIFICATIONS AND WITHDRAWAL OF BIDS

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

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

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

1.10 AWARD OF CONTRACT

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

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

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

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

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

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

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

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

1.11 SIGNING OF AGREEMENT

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

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

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 00 42 43
PROPOSAL

Owner: City of Ecorse

Project: 2025-2026 Sidewalk and Pavement repair Program

Project Location: The work described in these bid documents are for an as-needed contract. The work under this contract is intended to be repair work caused by but not limited to weather, deterioration, and water main breaks. The location and scope of work will be directed by the engineer as needed for the remainder of 2025 and the entire calendar year of 2026.

BIDDER INFORMATION

Bidder Name: _____

By (Printed Name): _____

Signature: _____

Address: _____

Phone No: _____

Email: _____

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

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

Bidder has examined copies of Contract Documents, (Project Manual dated October, 1 2025) which Bidder understands and accepts as sufficient for the purpose, including any and all Addenda officially issued, the receipt of which has been acknowledged.

A. Addendum _____ Acknowledged by: _____ Date: _____

B. Addendum _____ Acknowledged by: _____Date: _____

C. Addendum _____ Acknowledged by: _____ Date: _____

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

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

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

Item	Description	Quantity	Unit	Unit Price	Amount
1	Pavement, Remove and Excavate	1000	SYD	$_____	$_____

2	Concrete Sidewalk, Remove	5000	SFT	$_____	$_____
3	Subgrade Undercut and 21AA Backfill	50	CYD	$_____	$_____
4	Aggregate Base Course, 21AA	100	TON	$_____	$_____
5	Bituminous Wearing course, 5E10, 1.5-Inch	1000	TON	$_____	$_____
6	Concrete Pavement, 7-Inch Plain	500	SYD	$_____	$_____
7	Concrete Pavement, 8-Inch Plain	500	SYD	$_____	$_____
8	Concrete Pavement w/ Integral Curb, 9-Inch	500	SYD	$_____	$_____
9	Sidewalks, Concrete, 4-Inch	2000	SFT	$_____	$_____
10	Sidewalks, Concrete, 6-Inch	2000	SFT	$_____	$_____
11	Sidewalk Ramp, Concrete, 6-Inch	1000	SFT	$_____	$_____
12	Detectable Warning Surface	20	LF	$_____	$_____
13	Curb and Gutter – Det F4	200	LF	$_____	$_____

Total Contract Price (Items 1 through 13) $_____

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

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

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

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

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

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

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

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

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

The following documents are made a condition of this Proposal:

A. Required Bid Security

B. Legal Status of Bidder

C. Non-Collusion Affidavit

SECTION 00 43 13
BID BOND FORM

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

WHEREAS, the Principal has submitted a Bid for 2025-2026 Sidewalk and Pavement Repair Program.

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

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

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

SECTION 00 43 45
LEGAL STATUS OF BIDDER

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

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

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

☐ A partnership, all partners with their addresses are:

_____ _____

_____ _____

_____ _____

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

_____ _____

SECTION 00 45 13
STATEMENT OF BIDDER'S QUALIFICATIONS

This Proposal is submitted in the name of:

(Print) _____

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

Street: _____ City: _____

State: _____ Zip Code: _____

The undersigned hereby declares their legal status as checked below:

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

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

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

The Corporation is:

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

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

Name: _____ Title: _____

Address: _____

Name: _____ Title: _____

Address: _____

Name: _____ Title: _____

Address: _____

Name: _____ Title: _____

Address: _____

Signed this _____ day of _____, 20_____

By: _____

Printed Name: _____

Title: _____

SECTION 00 45 19
NON-COLLUSION AFFIDAVIT OF PRIME BIDDER

State of _____)

) ss:

County of _____)

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

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

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

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

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

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

Name of Bidder: _____

Signed By: _____

Title: _____

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

_____ Notary Public

_____ County, Michigan

Acting in the County of: _____

Notary Seal

My Commission Expires: _____

SECTION 00 51 00
NOTICE OF AWARD

Attention: _____ Date: _____

Project: 2025-2026 Sidewalk and Pavement Repair Program

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

This Project consists of: Project Description as delineated in your Bid submitted to City of Ecorse on 10-28-2025.

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

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

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

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

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

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

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

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

Owner: _____

Authorized Signature: _____

Copy to Wade Trim Associates, Inc.

SECTION 00 52 00
AGREEMENT

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

Contractor will complete the Work as specified or indicated in the Contract Documents. The as needed work is generally described as follows: approximately 2000 SFT of 4 inch sidewalk, 2000 SFT of 6 inch sidewalk, 1000 SYD of pavement removal, with 500 SYD of 8 inch concrete pavement, and 500 SYD of 9 inch concrete pavement, aggregate base and other related work. The location and limits of work will be directed by the Engineer. The work described in these bid documents are for an as-needed contract. The work under this contract is intended to be repair work caused by but not limited to, weather, deterioration, and water main breaks. The locations of work will be directed by the engineer as needed for the remainder of 2025 and the entire calendar year of 2026.

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

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

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

Owner and Contractor recognize that time is of the essence of this Agreement and that the Owner will suffer financial loss if the Work is not Substantially Complete within 30 days of notice to proceed, plus any extensions thereof allowed in accordance with Article 12 of Section 00 72 00. T

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

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

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

Person representing the Owner to whom requests for progress payments are to be submitted will be:

_____

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

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

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

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

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

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

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

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

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

This Agreement

Notice of Award

Notice to Proceed (if issued)

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

Specifications contained within Division 01 through 49 of the Project Manual

Plans bearing the following general title: 2025-2026 Sidewalk and Pavement Repair Program

Addenda numbers _____ to _____, inclusive

Documentation submitted by the Contractor prior to Notice of Award

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

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

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

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

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

IN WITNESS WHEREOF, the parties hereto have signed this Agreement in three counterparts.
One counterpart each has been delivered to Owner and Contractor, and one counterpart has been

delivered to the Engineer. The Contract Documents have been signed or identified by Owner and Contractor.

This Agreement will be effective on _____, 20____.

Owner: City of Ecorse

By: _____

Authorized Signature: _____

Attest: _____

Address for giving notices:

_____

_____

_____

Contractor: _____

By: _____

Authorized Signature: _____

Attest: _____

Address for giving notices:

_____

_____

_____

License No. _____

Agent for service of process: _____

SECTION 00 55 00
NOTICE TO PROCEED

To: _____ Date: _____, 20_____

_____

Attention: _____

Project: 2025-2026 Sidewalk and Pavement Repair Program

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

The following conditions must be met by Contractor:

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

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

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

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

Owner: _____

Authorized Signature: _____

COPY TO Wade Trim Associates, Inc.

SECTION 00 60 00 - PROJECT FORMS

PART 1 GENERAL

1.01 AVAILABLE FORMS

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

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

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 00 61 12.13
LABOR AND MATERIAL PAYMENT BOND FORM

Bond No. _____

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

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

_____.

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

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

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

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

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

Signed and sealed this day of _____, 20_____.

Signed, sealed and delivered in the presence of:

Witness for Contractor: _____

_____ (Principal)

_____ (Title)

By: _____

Witness for Surety: _____

_____ (Surety)

_____ (Title)

By: _____

_____ (Attorney-in-Fact) Seal

Address of Surety: _____

Telephone: _____

SECTION 00 62 76
CONTRACTOR'S APPLICATION FOR PAYMENT

Job Number: _____ Application No: _____ Date: _____

Owner: _____ Contractor: _____

Project: _____

Contract Date: _____

Period of this Application: _____ to _____

****

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

Previous Certificate: _____ Total Earned this Application: _____

CONTRACTOR'S CERTIFICATION

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

By: _____ Title: _____

CONTRACTOR'S DECLARATION

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

By: _____ Title: _____

SECTION 00 62 77
PAYMENT SCHEDULE

Application No.: _____ Date: _____Period: _____

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

SECTION 00 63 25
SUBSTITUTION REQUEST FORM

Specification Section: _____

Specified Product: _____

Proposed Substitution: _____

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

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

Explain any differences between proposed substitution and specified product.

Summarize experience with product and manufacturer in Project area.

Attach complete technical data and literature.

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

Submitted By: _____

Signature: _____ Date: _____

Position: _____ Company: _____

Address: _____

Telephone: _____ Email: _____

SECTION 00 63 70
CHANGE PROPOSAL FORM

Project: _____ Date: _____

Contractor: _____

Owner: _____

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

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

Contractor:	Engineer:	Owner:
By: _____	By: _____	By: _____
Date: _____	Date: _____	Date: _____

SECTION 00 65 20
SWORN STATEMENT

State of Michigan

County of _____}

being duly sworn, deposes and says:

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

Insert Legal Description of Property

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

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

(Some columns are not applicable to all persons listed)

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

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

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

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

_____ day of _____, 20____.

Notary Public: _____

_____ County, Michigan

My Commission Expires: _____

INSTRUCTIONS

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

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

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

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

SECTION 00 72 00 - GENERAL CONDITIONS

ARTICLE 1 DEFINITIONS

1.01 DEFINED TERMS

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

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

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

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

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

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

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

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

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

9. Claims --

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

19. Drawings -- See Plans.

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

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

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

    a. the transmission or communication of Electronic Documents;

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1.02 TERMINOLOGY

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

1. Whenever in the Contract Documents the terms “as ordered,” “as directed,” “as required,” “as allowed,” “as approved” or terms of like effect or import are used; or the adjectives “reasonable,” “suitable,” “acceptable,” “proper” or “satisfactory” or adjectives of like effect or import are used to describe a requirement, direction, review or judgment of Engineer as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate, in general, the completed Work for compliance with the technical requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective will not be effective to assign to Engineer any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.10 or any other provision of the Contract Documents.

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

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

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

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

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

ARTICLE 2 PRELIMINARY MATTERS

2.01 DELIVERY OF BONDS AND INSURANCE

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

2.02 COPIES OF DOCUMENTS

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

2.03 COMMENCEMENT OF CONTRACT TIME; NOTICE TO PROCEED

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

2.04 STARTING THE PROJECT

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

2.05 PRECONSTRUCTION MEETING

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

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

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

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

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

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

2.06 ELECTRONIC TRANSMITTALS

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

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

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

ARTICLE 3 CONTRACT DOCUMENTS INTENT AND REUSE

3.01 INTENT

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

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

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

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

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

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

G. Nothing in the Contract Documents creates:

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

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

3. any obligation on the part of Engineer to Contractor.

3.02 REFERENCE TO STANDARDS AND SPECIFICATIONS OF TECHNICAL SOCIETIES

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

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

C. No provision of any standard, specification, manual, code or instruction will 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 will 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 will carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor has a duty to and will promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor should reasonably have discovered and will obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.

B. If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, Contractor will report it to Engineer in writing at once, and, Contractor will not proceed with the Work affected thereby (except in an emergency as authorized by paragraph 6.18) until receiving written instruction or clarification from Engineer or Owner. However, Contractor will 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 will take precedence in resolving any conflict, error, ambiguity or discrepancy between the provisions of the Contract Documents and;

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

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

3.04 REQUIREMENTS OF CONTRACT DOCUMENTS

A. During the performance of the Work and until final payment, Contractor and Owner will submit to 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 will govern over scaled dimensions;

2. Plans will govern over Reference Standards;

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

3.06 AMENDING AND SUPPLEMENTING CONTRACT DOCUMENTS

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

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

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

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

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

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

2. Engineer's review of a Shop Drawing or Sample (pursuant to paragraph 6.21), or

3. Engineer's written interpretation or clarification (pursuant to paragraph 9.04).

3.07 REUSE OF DOCUMENTS

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

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

2. they will not reuse any of such Plans, Specification, other documents or copies on extensions of the Project or any other project without written consent of 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 will accept, Project-related correspondence, text, data, documents, drawings, information and graphics, including but not limited to Shop Drawings and other Submittals, in electronic media or digital format, either directly or through access to a secure Project website.

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

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

4.01 AVAILABILITY OF LANDS

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

4.02 SUBSURFACE AND PHYSICAL CONDITIONS; INVESTIGATIONS AND REPORTS

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

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

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

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

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

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

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

1. reviewing and checking all such information and data,

2. locating all Utilities during construction,

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

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

4.03 UNFORESEEN PHYSICAL CONDITIONS

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

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

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

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

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

D. Possible Price and Times Adjustments:

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

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

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

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

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

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

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

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

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

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

4.04 UTILITIES

A. Contractor's Responsibilities. The information and data shown or indicated in the Contract Documents with respect to existing Utilities at or adjacent to the Site, if any, is based on information and data furnished to Owner or 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 will have full responsibility for:

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

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

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

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

B. Notice by Contractor. If Contractor believes that an Utilities that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor will, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by paragraph 6.18), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

C. Engineer's Review. Engineer will:

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

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

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

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

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

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

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

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

F. Possible Price and Times Adjustments:

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

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

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

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

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

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

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

4.05 REFERENCE POINTS

A. Owner will provide engineering surveys for construction to establish property corners, monuments, bench marks and similar reference points which in Contractor's judgment are necessary to enable Contractor to proceed with the Work. Contractor will be responsible for the preservation of established reference points and will make no changes or relocations without the prior written approval of Owner. Contractor will report to 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 will be responsible for any Constituents of Concern uncovered or revealed at the Site which was not shown or indicated in Plans or Specifications or identified in the Contract

Documents to be within the scope of the Work and which may present a substantial danger to persons or property exposed thereto in connection with the Work at the Site. Owner will not be responsible for any such materials brought to the Site by Contractor, Subcontractor, Suppliers or anyone else for whom Contractor is responsible.

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

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

2. notify Owner and Engineer (and thereafter confirm such notice in writing). Owner will 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 will not be required to resume Work in connection with such Hazardous Environmental Condition or in any such affected areas until after Owner has obtained any required permits related thereto and delivered to Contractor special written notice:

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

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

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

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

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

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

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

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

ARTICLE 5 BONDS AND INSURANCE

5.01 PERFORMANCE AND OTHER BONDS

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

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

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

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

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

D. If Surety on any Bond furnished by Contractor is declared as bankrupt or becomes insolvent, or its right to do business is terminated in any state where any part of the Project is located, or it ceases to meet the requirements of clauses (1) and (2) of paragraph 5.01, Contractor will within 5 days thereafter substitute another Bond and Surety, both of which will be acceptable to Owner.

5.02 LICENSED INSURERS AND SURETIES

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

5.03 INSURANCE

A. Contractor will purchase and maintain during the term of the Project such insurance as will protect him, Owner(s) and 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 will extend through the Contract guarantee period.

g. Broad form property damage.

h. Cross liability endorsement.

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

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

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

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

a. Contractor,

b. all Subcontractors,

c. all Sub subcontractors,

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

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

6. Umbrella or Excess Liability:

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

7. Railroad Protective Liability:

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

8. Contractor's Professional Liability Insurance:

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

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

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

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

5.04 LIMITS OF LIABILITY

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

5.05 NOTICE OF CANCELLATION OR INTENT NOT TO RENEW

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

5.06 EVIDENCE OF COVERAGE

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

5.07 QUALIFICATION OF INSURERS

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

5.08 DAMAGE CLAIMS - ACKNOWLEDGMENT AND REPORTS

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

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

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

5.09 COST OF INSURANCE

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

5.10 WAIVER OF RIGHTS

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

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

C. 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 will extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.

5.11 RECEIPT AND APPLICATION OF INSURANCE PROCEEDS

A. Any insured loss under the policies of insurance required by paragraph 5.03.A.5 will be adjusted with Owner and made payable to Owner as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause. If no other special agreement is reached the damaged Work will be repaired or replaced, the monies so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order, Field Oder or Work Change Directive.

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

ARTICLE 6 CONTRACTOR'S RESPONSIBILITIES

6.01 SUPERVISION AND SUPERINTENDENCE

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

B. At all times during the progress of the Work, Contractor will assign and maintain a competent superintendent who will not be replaced without written notice to Owner and Engineer except

under extraordinary circumstances. Any superintendent or foreman who neglects to have Work done in accordance with the Plans and Specifications will be removed from the Project. The superintendent will be Contractor's representative at the Site and will have authority to act on behalf of Contractor. All communications given to the superintendent will be as binding as if given to Contractor.

6.02 LABOR AND WORKING HOURS

A. Contractor will provide competent, suitably qualified personnel in their various duties. Contractor will at all times maintain good discipline and order at the Site. Except as otherwise required for the safety or protection of persons, the Work, property at the Site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all Work at the Site will be performed during regular working hours (7:00 a.m. to 7:00 p.m.), and Contractor will not permit the performance of Work on Sunday or any legal holiday without 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 will furnish and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start up and completion of the Work.

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

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

6.04 SUBSTITUTES AND “OR-EQUALS”

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

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

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

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

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

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

2. be similar in substance to that specified,

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

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

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

E. All data to be provided by Contractor in support of any proposed “or-equal” or substitute item will be at Contractor’s expense. Engineer will be the sole judge of acceptability, and Engineer’s determination will be final and binding, may not be reversed through an appeal under any provisions of the Contract Documents, and no “or-equal” or substitute will be ordered, installed

or utilized without Engineer's prior written acceptance. 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 will 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 will not employ any Subcontractor, Supplier or other person or organizations, including those who are to furnish the principal items of materials or equipment, whether initially or as a substitute, against whom Owner or Engineer may have reasonable objection. Contractor will furnish Engineer a complete list of any Subcontractor, Supplier or other person or organization furnishing principal items of material or equipment within 4 days of request. Failure to object to any Subcontractor, Supplier, other person or organization by Owner or Engineer will 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 will submit an acceptable substitute and the Contract Price will be increased or decreased by the difference in cost occasioned by such substitution, and an appropriate Change Order will be issued. Contractor will not be required to employ any Subcontractor, Supplier, other person or organization against whom Contractor has reasonable objection.

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

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

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

F. If the amount of the subcontract or the nature of the Work to be performed thereunder warrants, Owner may require Subcontractor to furnish, for the benefit of Owner and Contractor jointly, Bonds in an amount proportioned to the amount of Subcontractor's subcontract, and for

the same purpose and under the same specifications as those of the general Contract. The Surety on the general Contract will not be eligible to furnish such Subcontract Bonds.

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

6.06 PATENT FEES AND ROYALTIES

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

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

6.07 PERMITS AND LICENSES

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

6.08 LAWS AND REGULATIONS

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

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

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

6.09 TAXES

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

6.10 USE OF PREMISES

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

6.11 REMOVAL OF DEBRIS AND CLEANING

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

6.12 LOADING STRUCTURES

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

6.13 PROTECTION OF UTILITIES

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

6.14 RECORD DOCUMENTS

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

6.15 SAFETY AND PROTECTION

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

1. all persons on the Work Site or who may be affected by the Work,
2. all the Work and materials or equipment to be incorporated therein, whether in storage on or off the Site, and
3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and Utilities and not designated for removal, relocation or replacement in the course of construction.

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

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

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

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

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

6.17 HAZARD COMMUNICATION PROGRAM

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

6.18 EMERGENCIES

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

6.19 SHOP DRAWINGS AND SAMPLES

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

Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by paragraph 6.21.

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

6.20 SUBMITTAL PROCEDURES

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

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

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

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

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

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

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

F. Contractor will furnish required Submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer ’s time for reviewing a fourth or subsequent submittal of Shop Drawings, sample, or other item requiring approval, and Contractor will be responsible for Engineer’s charges to 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 will 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 will be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and will not extend to means, methods, sequences, techniques or procedures of construction or to safety precautions or programs incident thereto. The review of a separate item as such will not indicate review of the assembly in which the item functions.

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

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

6.22 CONTINUING THE WORK

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

6.23 CONTRACTOR'S GENERAL WARRANTY AND GUARANTEE

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

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

2. normal wear and tear under normal usage.

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

1. observations by Engineer;

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

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

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

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

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

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

8. any correction of defective Work by Owner.

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

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

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

6.24 INDEMNIFICATION

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

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

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

a. the Work,

b. any activity associated with the Work, or

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

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

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

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

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

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

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

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

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

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

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

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

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

6.25 DELEGATION OF PROFESSIONAL DESIGN SERVICES

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

B. If professional design services or certifications by a design professional related to systems, materials, equipment, structures, means, methods, techniques or sequences of construction are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor will cause such services or certifications to be provided by a professional properly licensed in the state in which the project is located, whose signature and seal will appear on all drawings, calculations, specifications, certifications, and other Submittals prepared by such professional. Shop Drawings and other Submittals related to the Work designed or certified by such professional, if prepared by others, will bear such professional's written approval when submitted to Engineer.

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

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

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

ARTICLE 7 WORK BY OTHERS

7.01 RELATED WORK AT SITE

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

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

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

ARTICLE 8 OWNER'S RESPONSIBILITIES

8.01 COMMUNICATION TO CONTRACTOR

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

8.02 REPLACEMENT OF ENGINEER

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

8.03 FURNISHING DATA

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

8.04 PAY WHEN DUE

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

8.05 LANDS AND EASEMENTS; REPORTS AND TESTS

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

8.06 CHANGE ORDERS

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

8.07 INSPECTIONS, TESTS, AND APPROVALS

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

8.08 LIMITATION ON OWNER’S RESPONSIBILITY

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

not be responsible for Contractor’s failure to perform or furnish the Work in accordance with the Contract Documents.

8.09 UNDISCLOSED HAZARDOUS MATERIALS

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

8.10 OWNER’S DESIGNATED REPRESENTATIVE

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

ARTICLE 9 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 will be as set forth in the Contract Documents.

9.02 VISITS TO SITE

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

9.03 RESIDENT PROJECT REPRESENTATIVE

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

1. Schedules:

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

2. Conferences:

    a. Arrange a schedule of progress meetings and other job conferences as required in consultation with Engineer and 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 will be consistent with or reasonably inferable from the overall intent of the Contract Documents.

9.05 AUTHORIZED VARIATIONS IN WORK - FIELD ORDER

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

9.06 REJECTING DEFECTIVE WORK

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

9.07 SHOP DRAWINGS, CHANGE ORDERS, AND PAYMENTS

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

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

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

9.08 DETERMINATIONS FOR UNIT PRICE WORK

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

9.09 DECISIONS ON DISAGREEMENTS, CLAIMS

A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work performed thereunder. Claims, disputes and other matters relating to the acceptability of the Work, or the interpretation of the requirements of the Contract Documents pertaining to the execution and progress of the Work, will be referred

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

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

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

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

9.10 LIMITATIONS ON ENGINEERS RESPONSIBILITIES

A. Neither Engineer's authority to act under this Article 9 or elsewhere in the Contract Documents, nor any decision made by Engineer in good faith either to exercise or not exercise such authority, will 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 will also apply to Engineer's Consultant's, Resident Project Representative and assistants.

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

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

E. Neither Contractor, its agents or employees, nor any Subcontractors or Suppliers or their agents or employees, are intended beneficiaries of Engineer's agreement with 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 will be set forth in a Change Order.

2. Work Change Directives:

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

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

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

3. Field Orders:

a. 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 will perform the Work involved promptly.

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

10.02 OWNER-AUTHORIZED CHANGES IN THE WORK

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes will be

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

10.03 UNAUTHORIZED CHANGES IN THE WORK

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

10.04 CHANGE OF CONTRACT PRICE

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

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

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

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

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

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

1. a mutually acceptable fixed fee; or

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

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

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

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

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

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

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

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

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

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

10.05 CHANGE OF CONTRACT TIMES

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

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

10.06 CHANGE PROPOSALS

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

1. Procedures: Contractor will submit each Change Proposal to Engineer promptly (but in no event later than 5 days) after the start of the event giving rise thereto, or after such initial decision. Contractor will submit supporting data, including the proposed change in Contract

Price or Contract Time (if any) to Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data will be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal and consider any comments or response from Owner regarding the Change Proposal.

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

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

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

10.07 EXECUTION OF CHANGE ORDERS

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

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

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

3. changes in the Work which are:

a. ordered by Owner pursuant to paragraph 10.02,

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

c. agreed to by the parties, subject to the need for 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 will be deemed to be of full force and effect, as if fully executed.

10.08 NOTIFICATION TO SURETY

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

ARTICLE 11 CLAIMS

11.01 CLAIMS

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

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

C. Review and Resolution: The party receiving a Claim will review it thoroughly, giving full consideration to its merits. The two parties will seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.

D. Mediation:

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

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

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

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

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

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

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

12.01 COST OF WORK

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

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

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

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

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

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

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

5. Supplemental costs including the following:

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

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

        1) The rental rate established for each piece of Contractor owned equipment, including appurtenances and attachments to the equipment, used will be determined by use of the Rental Rate Blue Book for Construction Equipment, Volume 1, 2 or 3, as applicable; the edition which is current at the time the Work was started will apply. The established rental rate will be equal to the "Monthly" rate divided by 176; modified by the rate adjustment factor and the applicable map adjustment factor, plus the "Estimated Operating Costs per Hour."

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

12.02 ALLOWANCES

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

12.03 UNIT PRICE WORK

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

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

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

D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review Engineer's preliminary determinations with Contractor on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon 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 will be entitled to request an equitable adjustment in the Contract Times and Contract Price. However, Contractor's entitlement to an adjustment of the Contract Times or Contract Price is expressly conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

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

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

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

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

3. acts of war or terrorism.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

13.01 ACCESS TO WORK

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

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

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

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

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

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

13.03 UNCOVERING WORK

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

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

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

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

13.04 DEFECTIVE WORK

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

B. 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 will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 CORRECTION OR REMOVAL OF DEFECTIVE WORK

A. If required by Engineer or Owner, Contractor will promptly either correct all defective Work, whether or not fabricated, installed or completed, or if the Work has been rejected by Engineer, remove it from the Site and replace it with non-defective Work. Contractor will pay all claims, costs, losses, damages and expenses caused by or resulting from such correction or removal (including, but not limited to all costs of repair or replacement of work of others) and will take

no action that would void or otherwise impair Owner’s special warranty or guarantee, if any, on such Work.

13.07 GUARANTEE PERIOD

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

1. repair defective land or areas;

2. correct such defective Work;

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

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

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

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

13.08 ACCEPTANCE OF DEFECTIVE WORK

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

13.09 OWNER MAY CORRECT DEFECTIVE WORK

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

B. In exercising Owner's rights and remedies under this paragraph 13.09, Owner will proceed expeditiously. To the extent necessary to complete corrective and remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work, and

suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor will allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer's consultants such access to the Site as may be necessary to enable Owner to exercise Owner's rights and remedies under this paragraph 13.09.

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

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

ARTICLE 14 PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 SCHEDULES

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

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

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

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

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

14.02 APPLICATION FOR PROGRESS PAYMENT

A. At least 20 days before each Application for Payment falls due (but not more often than once a month), Contractor will submit to Engineer for review an Application for Payment, Contractor's Declaration, Payment Schedule, and updated Progress Schedules indicating the anticipated completion dates of the various stages of the Work and estimated payments during the next 3

months. Contractor's Application for Payment will be filled out on the form provided in the Contract Documents and signed by Contractor covering the Work completed as of the date of the Application for Payment and accompanied by such supporting documentation as is required by the Contract Documents and as Engineer or Owner may reasonably require. The Payment Schedule will be on the form provided in the Contract Documents or in a format acceptable to Engineer or Owner. On the second and all subsequent payments, partial Waivers of Lien and Sworn Statement will be required for all Work completed and paid for on previous certificates.

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

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

14.03 RETAINAGE

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

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

14.04 REVIEW OF APPLICATIONS FOR PROGRESS PAYMENT

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

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

1. the Work has progressed to the point indicated;

2. the quality of the Work is in accordance with the technical aspects of the Contract Documents subject to an evaluation of the Work as a functioning Project upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, a

final determination of quantities and classifications for any Unit Price Work under paragraph 12.03, and any qualifications stated in the recommendation; and

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

C. However, by recommending any such payment Engineer will not thereby be deemed to have represented that:

1. exhaustive or continuous on-Site inspections have been made to check the quality or the quantity of the Work; or

2. involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or

3. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

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

1. to supervise, direct or control the Work;

2. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;

3. for the failure of Contractor to comply with Laws and Regulations applicable to the furnishing or performance of Work;

4. for any failure of Contractor to perform or furnish Work in accordance with the Contract Documents;

5. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price;

6. to determine that title to any Work, materials, or equipment has passed to Owner free and clear of Liens.

E. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make such representations as stated above to Owner. Engineer may also refuse to recommend any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

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

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

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

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

5. Engineer has actual knowledge of the occurrence of any of the events enumerated in paragraph 15.02.

14.05 PAYMENT BECOMES DUE

A. Thirty (30) days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of paragraph 14.05.B) become due, (or only if Owner is a public agency, within 15 days after Owner receives the funds which are to be provided by a department or agency of the federal or state government, whichever is later, or in accordance with any time periods required by any applicable statute, rule or regulation) and when due will be paid by Owner to Contractor.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

C. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner will promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor corrects, to Owner's satisfaction, the reasons for such action. The reduction imposed will be binding on Contractor unless Contractor duly submits a Change Proposal contesting the reduction.

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

14.06 CONTRACTOR'S WARRANTY OF TITLE

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

14.07 SUBSTANTIAL COMPLETION

A. When Contractor considers the entire Work ready for its intended use Contractor will notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a Certificate of Substantial Completion. Contractor will at the same time submit to 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 will make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. Once Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary Certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer will attach to the certificate a punch list of items to be completed or corrected before final payment. Owner will have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to 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 will bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

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

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

14.08 PARTIAL UTILIZATION

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

1. Owner at any time may request Contractor in writing to permit Owner to use any part of the Work which Owner believes to be substantially complete and which may be so used without significant interference with construction of the other parts of the Work. If Contractor agrees, Contractor will certify to Owner and 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 will make an inspection of that part of the Work to determine its status of completion.

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

    b. If Engineer considers that part of the Work to be substantially complete, Engineer will execute and deliver to Owner and Contractor a certificate to that effect, fixing the date of Substantial Completion for that part of the Work, attaching thereto a punch list of items to be completed or corrected before final payment.

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

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

4. In lieu of the issuance of a certificate of Substantial Completion as to part of the Work, Owner may take over operation of a facility constituting part of the Work whether or not it is

Substantially Complete if such facility is functionally and separately usable; provided that prior to any such takeover, Owner and Contractor have agreed as to the division of responsibilities between Owner and Contractor for security, operation, safety, maintenance, correction period, heat, utilities and insurance with respect to such facility.

14.09 FINAL INSPECTION

A. Upon written notice from Contractor that the Work is complete, 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 will immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.10 FINAL APPLICATION FOR PAYMENT

A. After Contractor has completed all corrections to the satisfaction of Engineer and delivered all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, marked up record documents and other documents (all as required by the Contract Documents), and after Engineer has indicated that the Work is acceptable, subject to the provisions of paragraph 14.13, Contractor may make application for final payment following the procedure for progress payments.

B. The final Application for Payment will be accompanied by all documentation called for in the Contract Documents and such other data and schedules as Engineer may reasonably require, consent of Surety, if any, to final payment, together with complete and legally effective releases or waivers, satisfactory to Owner, of all Liens arising out of or filed in connection with the Work.

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

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

14.11 FINAL PAYMENT AND ACCEPTANCE

A. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation (all as required by the Contract Documents), Engineer is satisfied that to the best of Engineer’s knowledge, information and belief as a design professional that the Work has been completed and Contractor has fulfilled all of Contractor's obligations under the Contract Documents, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer’s Certificate for Payment and present the application to Owner for payment. At that time Engineer will give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of paragraph 14.13.

B. Otherwise, Engineer will return the Application to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor will make the necessary corrections and resubmit the Application.

C. If the Application and accompanying documentation are appropriate as to form and substance, Owner will, within 45 days (or within the time period required by any applicable statute, rule or regulation) after receipt thereof pay Contractor the amount recommended by 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 will do so in writing stating the appropriate sections of the Contract Documents upon which the rejection is based. Contractor may take the necessary remedial actions and resubmit the Application.

14.12 FINAL COMPLETION DELAYED

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

14.13 WAIVER OF CLAIMS

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

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

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

14.14 LATE PAYMENTS

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

ARTICLE 15 SUSPENSION OF WORK AND TERMINATION

15.01 OWNER MAY SUSPEND WORK

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

extension of the Contract Time, or both, directly attributable to any suspension if Contractor makes a Claim therefor as provided in paragraph 11.01.

15.02 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 will not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, damages and expenses sustained by Owner arising out of or resulting from completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, damages and expenses exceed such unpaid balance, Contractor will pay the difference to Owner. Such claims, costs, losses, damages and expenses incurred by Owner will be reviewed as to reasonableness by Engineer

and when so approved, incorporated in a Change Order, but when exercising any rights or remedies under this paragraph, Owner will not be required to obtain the lowest price for the Work performed.

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

15.03 TERMINATION FOR CONVENIENCE

A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy, elect to terminate the Agreement. In such case, Contractor will be paid (without duplication of any items):

1. for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination;

2. for actual expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials or equipment as required by the Contract Documents in connection with uncompleted Work; and

3. for reasonable expenses directly attributable to protecting work as a result of termination.

B. Contractor will not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

C. Upon such termination, Contractor will:

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

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

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

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

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

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

15.04 CONTRACTOR MAY STOP WORK OR TERMINATE

A. If Owner has failed to pay Contractor any sum finally determined to be due in accordance with the time limits specified in paragraph 14.05, Contractor may upon 7 days’ written notice to Owner and 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 will not relieve Contractor of Contractor's obligations under paragraph 6.22 to carry on the Work in accordance with the Progress Schedule and without delay during disputes and disagreements with Owner.

ARTICLE 16 FINAL RESOLUTION OF DISPUTES

16.01 METHODS AND PROCEDURES

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

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

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

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

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

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

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

a. The parties will submit the dispute to mediation under the mediation procedures outlined in the Construction Industry Arbitration Rules and Mediation Procedures of the American Arbitration Rules.

b. If the dispute is not resolved by mediation, the parties will proceed to resolve the dispute by arbitration in accordance with the Construction Industry Arbitration Rules and Mediation Procedures of the American Arbitration Association. The decision of the arbitrator(s) will be final and binding and is enforceable in a court of competent jurisdiction.

ARTICLE 17 MISCELLANEOUS

17.01 GIVING NOTICE

A. Whenever any provision of the Contract Documents requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:

1. in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended;

2. by registered or certified mail postage prepaid to, the last business address known to the giver of the notice;

3. or delivered in person to such person by a commercial courier service or otherwise to the recipient's place of business; or

4. by secure file transfer with receipt documentation or other document control software.

17.02 COMPUTATION OF TIME

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

17.03 GENERAL

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

B. All representations, warranties and guarantees made in the Contract Documents will survive final payment and termination or completion of this Agreement.

17.04 PROFESSIONAL FEES AND COURT COSTS INCLUDED

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

17.05 NONDISCRIMINATION OF EMPLOYMENT

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

17.06 POST COMPLETION DATE ENGINEERING AND INSPECTION COSTS

A. All engineering and inspection costs incurred after the specified completion date will be paid by Contractor to Owner prior to final payment authorization. However, Contractor will not be charged with any post completion date engineering and inspection costs when the delay in completion of the Work is due to the following and Contractor has promptly given written notice of such delay to Owner or 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 will be made at such times and in such amounts as Engineer will invoice Owner, provided, however said charges will be in accordance with Engineer's current rate schedule at the time the costs are incurred. Engineering and inspection costs so incurred will be deducted from Contractor's progress payments.

17.07 WAIVER OF CONSEQUENTIAL DAMAGES

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

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

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

B. This mutual waiver is applicable, without limitation, to all consequential damages due to either party’s termination or default. Nothing contained in this Section will be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents. Contractor also waives any Claim for consequential damages against Engineer where such Claims arise out of or relate in any way to the Project or the Contract Documents.

17.08 NO WAIVER

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

17.09 CONTROLLING LAW

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

17.10 HEADINGS

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

END OF SECTION

SECTION 00 73 00 - SUPPLEMENTARY CONDITIONS

PART 1 GENERAL

1.01 SUMMARY

A. These Supplementary Conditions amend and supplement Section 00 72 00 - General Conditions and other provisions of Contract Documents as indicated below. Provisions that are not so amended or supplemented remain in full force and effect.

B. The terms used in these Supplementary Conditions that are defined and have the meanings assigned to them in Section 00 72 00 - General Conditions.

1.02 MODIFICATIONS TO GENERAL CONDITIONS

A. **SGC-1.01 Defined Terms**

1. The definition for "As-Built Drawings" in Section 00 72 00 - General Conditions will be added as follows:

   As-Built Drawings -- Revised construction documents prepared by the Contractor that reflect all modifications made during the construction process. These include changes due to material availability, constructability issues, or design optimizations. These drawings serve as a contractual record to prove compliance with project requirements.

2. The definition for "As-Built Drawings" in Section 00 72 00 - General Conditions will be added as follows:

   Record Drawings -- Clean, finalized sets of drawings compiled by the Engineer using the Contractor’s as-built drawings and they incorporate all approved changes into the original design documents and represent the project’s final state as documented; these drawings may not be based on field verification.

3. The definition for “Substantial Completion” in Section 00 72 00 - General Conditions will be revised as follows:

   Substantial Completion -- The Work (or a specified part thereof) has progressed to the point where, in the opinion of the Engineer as evidenced by the Certificate of Substantial Completion, it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it was intended; or if no such certificate is issued, when the Work is complete and ready for final payment as evidenced by the Engineer’s written recommendation of final payment in accordance with Article 14.11 of Section 00 72 00 - General Conditions. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

B. **SGC-4.02 Subsurface and Physical Conditions; Investigations and Reports**

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

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

C. **SGC-4.05 Reference Points**

1. Delete Article 4.05 of Section 00 72 00 - General Conditions and replace it with the following:

   Contractor will be responsible for the preservation of established reference points and will make no changes or relocations without the prior written approval of Owner. Contractor will report to Engineer whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations. Reference points destroyed by negligence of Contractor will be replaced by Owner at the expense of Contractor. Construction Staking will be furnished by Contractor as provided in Division 01 of the Specifications.

D. **SGC-5.03 Additional Insured**

1. Add the following language as a new Article 5.03.A.9 of Section 00 72 00 - General Conditions:

   City of Ecorse, Wade Trim Associates, Inc., Wade Trim Associates, Inc. 's Subconsultant(s), and _____, and any other person or entity required to be named as an additional insured under the Contract Documents, including each of the aforementioned's respective parent companies, affiliates, subsidiaries, officers, directors, employees, and agents, are required to be designated as additional insureds on all policies of insurance required by Article 5.03 of the Section 00 72 00 - General Conditions and elsewhere in the Contract Documents (except for Worker's Compensation insurance and Professional Liability insurance, unless otherwise specifically required by the Contract Documents).

E. **SGC-5.04 Limits of Liability**

1. The required limits of liability for insurance coverages requested in Article 5.03 of Section 00 72 00 - General Conditions will be not less than the following:

   SGC-5.04.A Worker's Compensation

   Coverage A – Compensation: Statutory

   Coverage B – Employer's Liability

   Each Accident: $100,000

   Disease – Policy Limit: $100,000

   Disease – Each Employee: $100,000

   SGC-5.04.B Comprehensive General Liability

   General Aggregate: $1,000,000

   Products – Com/Ops Aggregate: $1,000,000

   Personal and Advertising Injury: $500,000

   Each Occurrence: $500,000

   Fire Damage (any one fire): $50,000

   Medical Expense (any one person): $5,000

SGC-5.04.C Comprehensive Automobile Liability

Bodily Injury: $500,000

Property Damage: $200,000

or combined single limit: $1,000,000

SGC-5.04.D Owner's Protective

General Aggregate:$1,000,000

Each Occurrence: $1,000,000

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

Cost to Replace at Time of Loss

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

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

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

12.04 LUMP SUM WORK

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

b. Renumber subsequent paragraphs accordingly.

G. **SGC-18 Liquidated Damages**

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

ARTICLE 18 LIQUIDATED DAMAGES

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

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

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

d. To unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to, acts of God, or of the public enemy, acts of

the Owner, acts of another Contractor in the performance of a Contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and abnormal and unforeseeable weather; and

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

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 00 91 13
ADDENDUM

To all prospective Bidders and others concerned, YOU ARE HEREBY ADVISED THAT the Contract Documents for the above referenced Project are revised in accordance with the following:

Section	Description of Change
Sheet	**Description of Change**

Attachments to this Addendum:

_____

This Addendum is hereby incorporated into the original Contract Documents for the bidding referred to above and is considered as binding as though originally appearing therein. Receipt of this Addendum must be noted in the place provided in Section 00 42 43 - Proposal, dated _____, 20_____.

SECTION 01 11 00 - SUMMARY OF WORK

PART 1 GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

1.02 The as needed work is generally described as follows: approximately 2000 SFT of 4 inch sidewalk, 2000 SFT of 6 inch sidewalk, 1000 SYD of pavement removal, with 500 SYD of 8 inch concrete pavement, and 500 SYD of 9 inch concrete pavement, aggregate base and other related work. The location and limits of work will be directed by the Engineer. The work described in these bid documents are for an as-needed contract. The work under this contract is intended to be repair work caused by but not limited to, weather, deterioration, and water main breaks. The locations of work will be directed by the engineer as needed for the remainder of 2025 and the entire calendar year of 2026.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 33 00 - Submittal Procedures

B. Section 01 50 00 - Temporary Facilities and Controls

1.04 WORK BY OTHERS

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

1.05 RIGHT-OF-WAY JURISDICTION/PERMITS

A. Work in the Wayne County Department of Public Services right-of-way requires a permit from the Wayne County Department of Public Services. Contractor will obtain the permit and pay all fees in connection with obtaining the permit. The fees for the permit are based upon a permit fee, plan review fee, and an inspection deposit.

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

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

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

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

1.06 COORDINATION

A. It will be the responsibility of the Contractor to coordinate Contractor's operations and those of the Contractor's subcontractors in such a manner so as to avoid interference and delays in the areas of common construction activities.

1.07 CONTRACTOR'S USE OF PREMISES

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

1.08 PHOTOGRAPHS

A. Photographs as specified in Section 01 33 00 - Submittal Procedures will be required for this Project.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 22 00 - UNIT PRICES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section describes the method of measurement and basis of payment for items of Work included in the Contract and specified in Section 00 42 43 - Proposal. Contractor will provide labor, material, tools, equipment and services required to complete the Work specified herein and indicated on the Plans.

B. The scope and quantity of Work estimated in the Proposal is the best estimate of the Engineer. It is anticipated that the quantity of Work to be completed will vary from the estimated quantities in Section 00 42 43 - Proposal.

C. Owner will make no allowances for items not included in Section 00 42 43 - Proposal.

1.02 ITEMS OF THE PROPOSAL

Item 1

Pavement Remove will be paid for at the Contract Unit Price per Square Yard (SYD). Price paid will be payment in full for labor, material, and equipment necessary for the removal of any pavement (regardless of material), as shown on the Plans or as determined by Engineer. This work will include, but is not limited to saw cutting, removal and disposal of asphaltic surface courses and integral curbs, removal and disposal of unsuitable materials, furnishing, placing, and compacting backfill, protection of existing improvements, barricading, and for other items necessary to complete the job, whether specifically mentioned or implied.

Measurement for removal of pavement will be determined by field measure of pavement removed.

Item 2

Concrete Sidewalk, Removal of the type and thickness specified on the Plans, will be paid for at the Contract Unit Price per Square Foot (SFT). Price paid will be payment in full for labor, material, and equipment necessary for the removal of the sidewalk, and sidewalk ramps and will include, but is not limited to, sawcutting, removal and disposal of unsuitable material, protection of existing improvements, barricading, and other items necessary to complete the job, whether specifically mentioned or implied.

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

Item 3

Subgrade Undercut Excavation and Backfill will be paid for at the Contract Unit Price per Cubic Yard (CYD). In cut areas, the price paid will be payment in full for labor, material, and equipment necessary for undercut excavation and disposal of unsuitable material, as determined by Engineer, below the proposed subgrade elevation, and will include, but is not limited to, providing, placing and compacting the undercut backfill material. In fill areas,

the price paid will be payment in full for labor, material, and equipment necessary for undercut excavation and disposal of unsuitable material, as determined by Engineer, below the existing ground elevation and will include, but is not limited to, the placement and compaction of the undercut backfill material to existing grade, and other items necessary to complete the Work, whether specifically mentioned or implied.

Measurement for subgrade undercut excavation and backfill will be determined by field measure.

Item 4

Aggregate Base Course, of the type and thickness specified on the Plans, will be paid for at the Contract Unit Price per Ton. Price paid will be payment in full for labor, material, and equipment necessary for the aggregate base course, compacted in place, and will include, but is not limited to, excavation, construction, protection of existing improvements, sidewalk remove furnishing, placing, and compacting backfill and subbase, also compacting and fine grading subgrade, also furnishing and applying chemical additives and water, also for barricading, and for other items necessary to complete the job, whether specifically mentioned or implied.

Measurement for aggregate base course will be in tons, with the installed tonnage determined by certified delivery tickets submitted to Engineer or his duly authorized representative. Delivery tickets will indicate the scale weight of the material, including chemical additives and moisture content. For material having a moisture content in excess of six (6) percent, the excess over six (6) percent will be deducted from the scale weight of the material when the moisture content is six (6) percent. Material placed to conform to the cross section and width specified on the Plans or as determined by Engineer will be paid for at the tonnage basis. If the width of the base course is increased to accommodate Contractor in placing forms, etc., the additional material installed beyond the width specified on the Plans or as determined by Engineer, will be at Contractor's expense.

Item 5

Bituminous Pavement, of the type and thickness specified will be paid for at the Contract Unit Price per Ton. Price paid will be payment in full for labor, material, and equipment necessary for the bituminous pavement and will include, but is not limited to, excavation, protection of existing improvements, also compacting and fine grading subgrade, also furnishing, placing and compacting backfill and subbase, also the furnishing, placing, rolling and compacting the various bituminous lifts or courses, also the furnishing and applying of prime and bond coats, barricading, restoration, and for items necessary to complete the job, whether specifically mentioned or implied.

Measurement for bituminous pavement will be in tons, with the installed tonnage determined by certified batch plant delivery tickets submitted to Engineer or his duly authorized representative, at the time of placement.

Item 6, 7

Pavement, Concrete of the type and thickness specified will be paid for at the Contract Unit Price per Square Yard (SYD). Price paid will be payment in full for labor, material, and equipment necessary for the concrete pavement and will include, but is not limited to, excavation, construction, protection of existing improvements, furnishing, placing and

compacting backfill and subbase, also compacting and fine grading subgrade, also the furnishing and installing of hook bolt assemblies, tie bar assemblies, dowel bar assemblies, contraction joint basket assemblies, expansion joint basket assemblies, polyethylene planks, polystyrene or other fillers, hot-poured elastic joint compound, mesh reinforcement, bar mat reinforcement, also forming, placing, jointing, finishing, texturing and curing the concrete, also providing protection against rain and cold weather, also for barricading, restoration, pavement gapping, part width construction, and other items necessary to complete the job, whether specifically mentioned or implied.

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

Item 8

Pavement, Concrete with Integral Curb of the type and thickness specified will be paid for at the Contract Unit Price per Square Yard (SYD). Price paid will be payment in full for labor, material, and equipment necessary for ____, and other items necessary to complete the job, whether specifically mentioned or implied.

Item 9, 10, 11, 12

Sidewalk, and Sidewalk Ramp, of the type and thickness specified on the Plans, will be paid for at the Contract Unit Price per Square Foot (SFT). Price paid will be payment in full for labor, material, and equipment necessary for sidewalks, sidewalk ramps, and driveway approaches and will include, but is not limited to, excavation, construction, protection of existing improvements, undercutting and backfilling the subgrade, compacting and fine grading subgrade, furnishing, placing, and compacting backfill and subbase, construction of expansion joints, also forming, placing, jointing, finishing and curing the concrete, construction of detectable warning, providing protection against rain and cold weather, barricading, restoration, and other items necessary to complete the job, whether specifically mentioned or implied.

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

Item 13

Curb and Gutter, Concrete of the type and width specified will be paid for at the Contract Unit Price per Linear Foot (LFT). Price paid will be payment in full for labor, material, and equipment necessary for the concrete curb and gutter section and will include, but is not limited to, excavation, construction, protection of existing improvements, furnishing, placing, and compacting backfill and subbase, compacting and fine grading subgrade, providing and installing hook bolt assemblies, tie bar assemblies, reinforcing steel, also forming, placing, jointing, finishing, texturing and curing the concrete, providing protection against rain and cold weather, backfilling, barricading, restoration, gapping, and other items necessary to complete the job, whether specifically mentioned or implied.

Measurement for concrete curb and gutter will be determined by field measure of curb and gutter in place.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 19 - PROJECT MEETINGS

PART 1 GENERAL

1.01 PRECONSTRUCTION MEETING

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

B. Schedule:

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

C. Attendance:

1. Owner
2. Engineer
3. Contractor
    a. Major Subcontractors
4. Utility Companies
5. Safety Representatives
6. Governmental Agencies

D. Agenda:

1. Distribution by the Contractor and discussion, review and acceptance of:
    a. List of names and telephone numbers for superintendent, foreman and other key personnel.
    b. List of major Subcontractors and Suppliers.
    c. Projected construction preliminary progress schedules.
    d. Preliminary schedule of Shop Drawings and Sample submittals.
    e. Estimated monthly payment schedule and schedule of values
2. Critical Work sequencing.
3. Major equipment deliveries and priorities.
4. Project coordination.
5. Responsibilities of Owner, Engineer, Contractor and other agencies.
6. Procedures and processing of:
    a. Field decisions.
    b. Proposal requests.

c. Submittals.

d. Change Orders.

e. Applications for Payment.

7. Adequacy of distribution of Contract Documents.
8. Procedures for maintaining Record Documents.
9. Use of premises.
10. Construction facilities, controls and construction aids.
11. Temporary utilities.
12. Safety and first aid procedures.
13. Security procedures.
14. Housekeeping procedures.
15. Testing

E. Minutes:

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

1.02 PROGRESS MEETINGS

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

B. Schedule:

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

C. Attendance:

1. Engineer
2. Contractor
3. Subcontractor as appropriate to the agenda.
4. Suppliers as appropriate to the agenda.
5. Others

D. Agenda:

1. Review minutes of previous meeting.
2. Review of work progress since previous meeting.
3. Review field observations, problems, conflicts.
4. Review problems which impede Construction Schedules.

5. Review of off-site fabrication, delivery schedules.
6. Review corrective measures and procedures to regain projected schedule.
7. Review revisions to Construction Schedules.
8. Review plan progress, schedule, during succeeding Work period.
9. Review coordination of schedules.
10. Review submittal schedules; expedite as required.
11. Review maintenance of quality standards.
12. Review proposed changes for:
    a. Effect on Construction Schedule and on completion date.
    b. Effect on other Contracts of the Project.
13. Other business.

E. Minutes:

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

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Contractor will submit Shop Drawings, product data, and samples, as required by the individual Specification sections, to the Engineer for review in accordance with the provisions of Section 00 72 00 - General Conditions.

1.02 PROGRESS SCHEDULES

A. Contractor will submit one (1) electronic copy in PDF format of Progress Schedules indicating the starting and completion dates of the various stages of the Work and estimated payments to the Engineer.

1. Submit proposed Progress Schedules to the Engineer prior to the Pre-Construction Meeting.

2. Distribute hard copies of the Progress Schedules to attendees during the Pre-Construction Meeting for discussion.

3. Update the Progress Schedule submit electronically (in PDF format) to the Engineer as a part of applications for progress payments, through completion of the Work. Failure to update Progress Schedule may be the basis for rejection of Applications for Progress Payments.

1.03 SHOP DRAWING SCHEDULE

A. Submit one (1) electronic copy in PDF format of the Shop Drawing Schedule indicating the individual items and submission dates to the Engineer.

1. Submit a preliminary Shop Drawing Schedule in accordance with the requirements in Section 00 72 00 prior to the Pre-Construction Meeting.

2. Distribute hard copies of the Shop Drawing Schedule during the Pre-Construction Meeting for discussion.

3. Submit a final electronic copy of the Shop Drawing Schedule (in PDF format) at least 10 calendar days prior to submitting the first Application for a Payment.

1.04 SCHEDULE OF VALUES

A. Submit one (1) electronic copy in PDF format Schedule of Values of the Work to the Engineer.

1. Submit a preliminary Schedule of Values prior to the Pre-Construction Meeting.

2. Distribute hard copies of the Schedule of Values during the Pre-Construction Meeting or discussion.

3. Prepare a final Schedule of Values (in PDF format) in accordance with the Section 00 72 00 in sufficient detail to serve as the basis for payments during construction. Submit the Schedule of Values to the Engineer for review at least 10 calendar days prior to submitting the first Application for Payment.

1.05 APPLICATIONS FOR PAYMENT

A. Submit one (1) electronic copy in PDF format Applications for Payment to the Engineer in accordance with the provisions of Article 14 of Section 00 72 00.

B. Applications for Payment will be made on forms provided by or approved by the Engineer.

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

2. Copies of these forms, with Project specific information completed by the Engineer, will be given to the Contractor at the preconstruction meeting or, if applicable, after approval of the final Schedule of Values.

C. Submit a completed Payment Schedule with an executed Contractor's Application for Payment and Contractor's Declaration to the Engineer not more than once per month.

D. Engineer will certify payments with the use of Engineer's Certificate for Payment.

1.06 SHOP DRAWINGS

A. Shop Drawings will be presented in a clear and thorough manner. Details will be identified by reference to plan sheet number, detail number if applicable, and specification Section number, and article number.

1.07 PRODUCT DATA

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

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

1.08 SAMPLES

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

1.09 SUBMISSION REQUIREMENTS

A. Make Submittals in accordance with the approved Submittal Schedule, and in such sequence as to cause no delay in the Work or in the work of any other contractor. No damages will be awarded, or extension of time granted, due to the Shop Drawing and product data review process.

B. Submit an entire package of Shop Drawings and Product Data information for major items of Work so that the Engineer can review the package as a unit.

C. Submit one (1) electronic copy in PDF format of Shop Drawings and Product Data information containing the following information at a minimum:

1. Field dimensions clearly identified as such.

2. Relation to adjacent or critical features of the Work or materials.

3. Applicable standards, such as ASTM or Federal Specification Numbers.
4. Identification of deviations from Contract Documents.
5. Identification of revisions on resubmittals.
6. Project Title, Date of Submission, Date of Previous Submission, and Specification Section number.

D. Contractor must initial or sign Shop Drawings and Product Data submittals, certifying the Contractor's review and approval of Submittal per Section 00 72 00; verification of products, field measurements, field construction criteria, and coordination of the information within the submittal with requirements of the Work and of Contract Documents.

E. Engineer will initial or sign Shop Drawings and Product Data submittal and will indicate the status of the Submittal, or requirements for resubmittal. Engineer will return to the Contractor one (1) electronic copy of the Shop Drawing and/or Product Data submittal (in PDF format) for distribution or for resubmission.

1.10 ENGINEER'S REVIEW

A. Upon receipt of any Submittal defined above, the Engineer will:

1. Check each for completeness, clarity, correctness, cohesiveness, legibility, and reproducibility.
2. Review each only for general conformity with the Contract Documents as specified in Section 00 72 00.
3. Respond to the submittal within 15 calendar days of receipt from Contractor.
    a. Contractor to allow for increased time for large or complex submittals; up to 30 calendar days may be required for major equipment and materials or Submittals which require review by more than one engineering discipline.

B. After review of any Submittal, the Engineer will appropriately affix a stamp, electronic notation box or other means, signifying the Submittal as having received full consideration and review.

C. The "status" of any such Submittal or portion thereof, as appropriate, will be evidenced by any one or more of the following notations clearly signified by a "X" or other similar mark placed in the box adjacent to the notation:

1. Notations for Engineer's Review:
    a. Approved
    b. Approved as Noted
    c. Revise and Resubmit
    d. Rejected - See Remarks
    e. For Record Only
2. Notations for Response Required by Contractor:
    a. None

b. Confirm

c. Resubmit

D. Notation Meanings:

1. Elements marked "Approved” indicate that the Contractor may commence with construction, fabrication or purchase of such items.

2. Elements marked "Approved as Noted" may require further action by the Contractor before commencing with construction, fabrication or purchase:

a. Contractor proceeds in strict accordance with the Engineer’s notes and/or required corrections/deletions/additions indicated thereon;

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

3. Elements marked “Revise and Resubmit” indicate that further comments or explanations have been affixed to the Submittal, which may require action(s) by the Contractor before Engineer will mark the Submittal "Approved" or "Approved as Noted."

4. Elements marked "Rejected - See Remarks" indicate that the Contractor must make the required corrections as shown or noted and resubmit such items to the Engineer for further review.

5. Elements marked "For Record Only" indicate that the Engineer has not reviewed the Submittal and will maintain the information submitted as part of the project record.

6. Elements marked “None” indicate that the Submittal requires no further action by the Contractor.

7. Elements marked “Confirm” requires the Contractor to provide affirmation to the Engineer regarding comments, notes, markings, etc. made by the Engineer, and to affirm that the Contractor will comply with the comments, notes, markings, etc.

8. Elements marked “Resubmit” indicate that the Contractor may not commence with construction, fabrication or purchase of such items, and that the Contractor must resubmit items for review that comply with the Contract Documents in the event that those originally submitted do not, or with any comments, notes, markings, etc. made by the Engineer.

1.11 RESUBMISSION REQUIREMENTS

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

1.12 MANUFACTURER'S OPERATION AND MAINTENANCE DATA

A. Submit one (1) electronic copy in PDF format and one (1) bound copy of all operation and maintenance data required per the various Specification sections.

1. Prior to 50% completion of the Project, Contractor will have submitted one (1) acceptable copy to the Engineer for review.

B. Final copies of the operation and maintenance data will be bound in a suitable number of 3-inch or 4-inch, 3-ring hard cover binders. Permanently imprinted on the cover will be the

words "Manufacturer's Operation and Maintenance Data", Project title, location of the Project, and the date. A table of contents will be provided in the front of each binder to list the various sections in the manual.

C. The information to be provided in each section of the manual, for each piece of equipment and project component will include, but not be limited to, detailed equipment drawings; sections cut through all of the major equipment and sub-assemblies; installation and operational procedures; complete wiring and piping schematics; lubrication materials and procedures; maintenance procedures; and parts lists complete enough to permit identification of parts by nomenclature, manufacturer’s part number and use.

D. At the front of each section a maintenance schedule will be provided for each piece of equipment in the section.

1. The schedule will display the daily, weekly, monthly, semi-annual, annual or fraction thereof, lubrication and preventative maintenance required in order to meet warranty conditions and the manufacturer's recommendations for optimum performance and life of the unit.

2. A common schedule format is to be developed and used for all of the sections. Photocopies or reproductions of the manufacturer's literature will not be accepted.

1.13 AUDIO/VIDEO ROUTE SURVEY

A. When required in Section 00 42 43 - Proposal or Section 01 11 00 - Summary of Work, furnish the Engineer with an "Audio/Video Route Survey" record of the existing conditions prior to the start of construction. Contractor must enlist the services of a firm having a minimum of one (1) year experience in audio/video recording of construction projects.

B. Prior to beginning the audio/video recording, review with Engineer the Project requirements to ensure that the audio/video is adequate for its intended purpose. Owner will have the authority to designate areas for which coverage may be added or omitted. The audio/video recording will be done prior to placement of materials or equipment on the construction area and furnished one (1) week prior to the pre-construction meeting.

C. Format:

1. Audio/Video route survey will be submitted in the format(s) as specified in Section 01 11 00.

a. Audio/video route survey submission will be on USB media

b. Format: USB – Video

c. Video Encoding: Highest available bit rate (6-9 Megabit), 60 fields per second interlaced video

d. Audio Encoding: Uncompressed stereo wave or stereo Dolby Digital (256 kilobit or better)

e. Aspect Ratio: 4x3 (720x480 pixels)

f. No Macrovision or other copy protection encoding. No region code or region code 1.

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

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

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

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

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

   2. The time information will consist of hours, minutes, and seconds, separated by colons. For example, hh:mm:ss.

H. Engineering stationing numbers must be continuous, accurate and correspond to the Project stationing and must include the standard engineering symbols. For example, Station 14+84.

I. Recording will be done during times of good visibility. No recording will be done during periods of visible precipitation, or when more than ten (10) percent of the ground area is covered with snow or standing water, unless otherwise authorized by the Owner.

J. In some instances, audio/video coverage may not be suitable for recording necessary details. In such instances, the Owner may specify still photographs to provide coverage. One (1) color photograph will be provided in accordance with this Section with a suitable description of the photograph’s location.

K. Any portion of the Audio/Video Route Survey of insufficient quality as determined by the Engineer will be redone by the Contractor at no additional cost to the Owner.

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

1.14 PHOTOGRAPHS

A. When required in Section 00 42 43 - Proposal or Section 01 11 00 - Summary of Work, furnish the Engineer with a total of 6 to 10 digital color photographs each month during construction of the Project, unless some other number and times is specified in Section 01 11 00 - Summary of Work.

B. Photos will be in digital format (i.e., JPEG, TIFF, GIF, PNG or PDF) and will have a minimum resolution of 300 dpi.

C. The following information will be placed on the photo itself or embedded in the digital file:

   1. Project Title

   2. Contract Number

   3. Description of photo's content

   4. Date and Time of photo

D. Submit photographs monthly along with the Application for Payment as described in Article 14 of Section 00 72 00.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 45 00 - QUALITY CONTROL

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Sampling of materials will be made by the Engineer in accordance with the methods designated by the Specifications. Contractor will furnish such facilities as the Engineer may require for collecting, storing, and forwarding samples to the Laboratory. Contractor will furnish the required samples to the Owner without charge.

1.02 TESTS OF MATERIALS

A. Materials in the Work will meet the requirements of the Contract Documents.

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

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

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

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

1.03 CERTIFICATION OF MATERIALS

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

1.04 SOURCE QUALITY CONTROL

A. Testing identified in the Contract Documents for quality control, which is required to establish quality of materials, equipment or fabricated items, will be paid for by the Contractor unless otherwise noted.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SITE ACCESS AND PARKING

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

B. Contractor will maintain driveways a minimum of 15 feet (5 meters) wide between and around combustible materials in storage and mobilization areas.

C. Contractor will maintain traffic areas as free as possible of excavated materials, construction equipment, products, snow, ice, and debris.

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

1.02 TRUCKING ROUTE AND PUBLIC ROAD MAINTENANCE

A. Prior to the start of construction, the Contractor will submit for review a schedule and list indicating the streets and roads within the municipality that Contractor's equipment will use off the Project site.

B. Contractor will comply with safety requirements, weight restrictions and speed limits.

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

D. Paved streets will be maintained in a reasonable state of cleanliness and the Contractor will remove accumulations of debris, dirt or mud caused by Contractor's operations. Removal will be done in such a manner as to prevent the release of dust. This will be done at least every day at the close of each day's operation or additionally when requested by the Engineer.

E. Roads or streets damaged by the Contractor’s operations, will be repaired or removed and replaced to satisfactions of the agency having jurisdiction at no additional cost to the Project.

F. In order to ensure adequate street maintenance and restoration as outlined above, the Contractor may be required to deposit with the agency having jurisdictiona cash Road Protection Bond. This Bond, if required, will be held in escrow until final release is given by the agency having jurisdiction.

1. In the event the Contractor fails or neglects to maintain or restore the streets to the satisfaction of the agency having jurisdiction, the agency having jurisdiction will have the required maintenance or restoration work done and the cost incurred will be deducted from the Road Protection Bond.

2. At the completion of the Project, the agency having jurisdiction will return the Road Protection Bond less any monies expended by the agency having jurisdiction and will render to the Contractor an accounting of all monies so expended.

G. Contractor will not store any equipment, supplies, construction material or excess excavated material on any roads or streets unless otherwise approved by the Engineer.

1.03 EMERGENCY ACCESS

A. Contractor will at all times provide emergency access to property in the vicinity of the construction for police vehicles, fire equipment, ambulances or other emergency vehicles to protect life, health and property. Areas damaged by emergency vehicles will be restored by the Contractor at no additional cost to the Owner.

1.04 PRIVATE OR PUBLIC ROADS, SIDEWALKS, AND PARKING AREAS

A. Where public roads, driveways, parking areas and sidewalks are encountered throughout the community, the Contractor will maintain those portions affected by the construction operations in a passable condition until such time as final restoration of these improvements can be made as specified.

1. If, in the opinion of the Engineer, the public safety is in danger or the necessity exists for maintaining traffic, the Engineer may direct that backfilling be completed immediately.

2. In the event that the necessary backfill material and equipment are not available when direction is given for immediate backfill, the trench will be backfilled with native material to provide for the necessary maintenance of traffic and safety; however, the native material will be removed within 48 hours and the trench properly backfilled as specified.

B. Contractor will provide written notice to residences and businesses of driveway access interruption 72 hours in advance of interruptions.

1. Written notices require approval for distribution from the Engineer.

2. Contractor will provide the Engineer with copies of notices at least five (5) working days in advance of their distribution for review and approval.

C. Where private roads are encountered throughout the community, the Contractor will maintain those portions affected by its construction operations in a passable condition. These roads will be maintained by the use of 21A road maintenance gravel, stone or slag.

1. In the event the original subbase has been destroyed, the Contractor will furnish and install1-inch to 2-inch aggregate to stabilize the existing subbase.

D. Upon completion of the construction activities, the Contractor will shape and regrade these roads leaving them in a condition as good as or better then original, and adequate for normal travel.

1.05 WORK WITHIN RAILROAD COMPANY RIGHT-OF-WAY

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

1.06 ROAD CLOSING

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

to closing a street, road, or section thereof, the Contractor will provide the Engineer with a copy of a detour plan approved by the agency having jurisdiction over the roads.

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

C. During the time that the road is closed, the Contractor will make provision for trash, leaf, and rubbish (garbage) pickup.

1.07 MAINTAINING TRAFFIC

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

B. Where the shoulder is used to maintain traffic, the shoulder will be graded, surfaced, treated for dust, constructed, or reconstructed, as specified herein or as shown on the Plans.

C. If the construction work is suspended due to weather conditions, winter shut down or for any other reason, sufficient labor, materials and equipment will be ready for immediate use at all times for the proper maintenance of traffic. Surfacing materials and dust palliatives will be applied at such times and locations and in such amounts as necessary to safely maintain traffic and as determined by the Engineer.

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

E. Contractor will furnish, erect and maintain all signs, barricades, lights, and traffic regulators, in accordance with the requirements of the current "Michigan Manual of Uniform Traffic Control Devices".

1. Furnish all flagmen and watchmen as are necessary to maintain and safeguard traffic along the entire Project. Failure to comply with these requirements may be cause for the Owner to issue a stop Work order, which will remain in effect until all necessary devices are in place and operational. The issuance of a stop Work order will not be reason for granting additional compensation or an extension to the Contract Time.

2. Furnishing, installing, and maintaining traffic control devices will be incidental to the Project unless otherwise provided for in the Proposal.

1.08 EXISTING SIGNS

A. No stop sign, traffic control or warning device or sign will be taken down until the agency having jurisdiction over the roads has been notified and arrangements for the immediate reinstallation has been made. Contractor will provide temporary signs, traffic control devices, warning devices, or watchmen continuously from the time the item is removed until it is

reinstalled. Signs removed will be replaced with signs meeting requirements of the agency having jurisdiction over the roads.

1.09 TEMPORARY ELECTRICITY AND LIGHTING

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

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

1.10 TELEPHONE

A. Contractor is required by MIOSHA regulations to provide telephone service for contacting emergency services. Such emergency telephone service will also be available for the use of the Owner and Engineer whether or not a field office is required for the Project. Emergency phone numbers are required to be posted per MIOSHA regulations

B. Contractor will pay all costs for installation, maintenance and removal, and service charges for local calls to provide service for Contractor's construction site office as well as for the Engineer's field office. Toll charges for calls relating to Project business will be at the Contractor's expense.

1.11 USE OF WATER

A. Contractor will acquire permits, post bonds and pay fees required by the local agency having jurisdiction prior to using any hydrant or any other source of water.

B. Contractor will reimburse the local community for all water consumed during course of the Project at the current rate as set by the agency having jurisdiction.

1.12 SANITARY PROVISIONS

A. Contractor will be responsible for installation, maintenance and removal of temporary sanitary facilities per MIOSHA regulations for use of construction personnel including the Owner and Engineer. Rules and regulations of the State and local health officials will be observed, with precautions taken to avoid creating unsanitary conditions.

1.13 POTABLE WATER

A. Contractor will furnish a supply of potable water per MIOSHA requirements, available for use of construction personnel including the Owner and Engineer.

1.14 MEDICAL SERVICES AND FIRST AID

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

1.15 POSTAL SERVICE

A. Residents in this Project area may receive their mail at roadside mailboxes. Since the postal service will not deliver mail to a resident without a mailbox or a mailbox that is not in its proper position, the Contractor will relocate, replace and repair all mailboxes and posts in a condition and height acceptable to the post office within 24 hours of the removal.

B. If required, the Contractor will furnish new posts for the mailboxes if the existing posts are broken or rotted to the extent that they cannot be reused.

C. Any mailbox damaged by the Contractor's operations or by anyone else while the box is down due to the Contractor's operation, will be replaced by the Contractor with a new mailbox meeting the postal officials' specifications and the resident's name and address neatly lettered with paint or other acceptable means to the satisfaction of the resident and postal authorities.

D. The cost for relocating mailboxes will be incidental to the Project unless otherwise specified in Section 00 42 43 - Proposal.

1.16 NEWSPAPER DELIVERY

A. Residents in this Project area may receive their newspapers at roadside tubes. Since the resident arranges for newspaper delivery, the Contractor will notify the resident 24 hours prior to removal of any newspaper tube.

B. Newspaper tubes damaged by the Contractor while carrying out Contractor's operations or by anyone else while the tube is down due to the Contractor's operation, will be replaced as agreed between the Contractor and the newspaper who owns the damaged tube. The cost will be incidental to the Project.

1.17 BUS STOPS AND SHELTERS

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

1.18 ENGINEER'S FIELD OFFICE

A. When called for in the Summary of Work, Section 01 11 00 - Summary of Work, the Contractor will furnish and maintain, for the exclusive use of the Engineer, an approved weatherproof building as a field office. The building will be located as directed by the Engineer, in full view of the Work and with at least one (1) window facing construction operations.

B. Engineer’s field office will meet the following minimum requirements:

1. securely fixed to foundation
2. structurally sound and watertight
3. stairs and landings for doors as necessary
4. three hundred (300) square feet (28 m2)
5. three operable and locking windows with screens and storms.
6. two locking, standard sized, entrance/exit doors
7. two telephone lines

8. two telephone jacks for each line
9. one telephone
10. one facsimile machine
11. 120 volt electrical service per NEC, complete
12. one 36" x 42" (1m x 1.1m) drafting table
13. one drafting stool
14. one 30" x 60" (.75m x 1.5m) desk
15. one four drawer locking file cabinet
16. two desk chairs
17. one plan rack (minimum capacity eight plan sets)
18. one first aid kit
19. one 10A:80-B:C fire extinguisher
20. automatically controlled heating, ventilating, air conditioning system to maintain temperature between 68 and 76 degrees Fahrenheit, year round.

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

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

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

F. The cost for furnishing and installing the field office, for furnishing utilities and utility service, and for maintenance of the field office and facilities, unless otherwise specified in the Proposal, will not be paid for separately but will be included in the price bid for various items of Work under the Contract. The building will be removed by the Contractor upon completion of the Contract and will become Contractor's property.

1.19 BY-PASS PUMPING

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

B. For sanitary sewerage, by-pass piping will be PVC Schedule 80, ABS truss pipe, equivalent with solvent welded joints, HDPE with butt fused joints, or _____. Flexible hoses of whatever

types are not acceptable. Bypassed flow will be discharged to a sanitary sewer of acceptable size to handle the bypassed and existing flows. Contractor will plan construction operations such that there will be no backups, leaks, or discharges of pollutants.

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

D. Costs for pumping and by-passing flow will be included in the unit price bid for other items of Work unless otherwise specified in the Proposal.

E. Contractor will submit a by-pass pumping/diversion scheme to the Engineer for approval not less than 15 calendar days prior to any anticipated by-pass pumping/diversion. The by-pass pumping plan will include pumping capacity and expected flow rates.

PART 2 PRODUCTS

2.01 BARRICADES, ARROW BOARDS, TEMPORARY PAVEMENT MARKINGS, AND TEMPORARY SIGNS

A. Barricades, arrow boards, temporary pavement markings, temporary signs, and other traffic control devices will be in accordance with the current edition of the MDOT Standard Specifications for Construction, and the current edition of the "Michigan Manual of Uniform Traffic Control Devices".

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 57 13 - TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes furnishing, installing, maintaining, and removing at project completion, soil erosion and sedimentation control devices. Devices include silt fence, straw bales, turbidity barriers, temporary gravel construction entrance/exits, inlet filters, ditch sediment traps, etc.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 89 00 - Site Construction Performance Requirements

C. Section 31 23 13 - Subgrade Preparation

D. Section 31 23 33 - Trenching and Backfilling

E. Section 32 92 19 - Seeding

1.03 REFERENCE STANDARDS

A. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc-Type Apparatus

B. ASTM D4491/D4491M - Standard Test Methods for Water Permeability of Geotextiles by Permittivity

C. ASTM D4533/D4533M - Standard Test Method for Trapezoid Tearing Strength of Geotextiles

D. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

E. ASTM D4751 - Standard Test Methods for Determining Apparent Opening Size of a Geotextile

F. ASTM D6241 - Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile- Related Products Using a 50-mm Probe

1.04 REQUIREMENTS OF REGULATORY AGENCIES

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

B. Comply with requirements of the agency having jurisdiction. Owner may withhold payment to Contractor equivalent to any fines resulting from non-compliance with applicable regulations.

1.05 PERFORMANCE REQUIREMENTS

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

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

C. Control increased storm water runoff due to disturbance of surface cover due to construction activities for this Project.

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

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

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

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

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

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

1.06 SUBMITTALS

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

B. Contractor must provide evidence of Storm Water Operator license.

PART 2 PRODUCTS

2.01 SILT FENCE

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

1. Average Opening Size: 30 US std Sieve , maximum; ASTM D4751.

2. Permittivity: 0.05 sec-1, minimum; ASTM D4491/D4491M.

3. Ultraviolet Resistance: Retaining at least 70% of tensile strength; ASTM D4355/D4355M after 500 hours exposure.

4. Tensile Strength: 100 lb - f minimum, in cross-machine direction;124 lb - f minimum in machine direction; ASTM D4632/D4632M.

5. Elongation: 15 to 30%; ASTM D4632/D4632M.

6. Tear Strength: 55 lb - f minimum; ASTM D4533/D4533M.

B. Posts will be 2 inch cross section hardwood stakes, minimum 3 feet long.

2.02 TURBIDITY BARRIER

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

1. Consist of vinyl laminate on 1000 denier polyester fabric weighing 18 oz per sq yard, minimum.
2. Tensile strength of fabric will be 220 lb - f, minimum.
3. Edges of fabric to be reinforced with minimum 5/8 inch diameter polypropylene rope.
4. Ballast chain minimum 5/16 inch galvanized steel.
5. Buoyancy blocks providing buoyancy of 18 lb - f.
6. Length of curtain (water depth) 5 feet.

2.03 DEWATERING DISCHARGE FILTER BAG

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

1. Tensile Strength: 180 lb - f minimum; ASTM D4632/D4632M
2. Elongation: 50 percent minimum; ASTM D4632/D4632M
3. CBR Puncture Strength: 300 lb f; ASTM D6241
4. Trapezoidal Tear: 70 lb - f; ASTM D4533/D4533M
5. Flow Rate: 80 gal/min/sft Minimum; ASTM D4491/D4491M
6. Permittivity: 1.4 sec -1 minimum; ASTM D4491/D4491M
7. Apparent Opening Size: 80 US std Sieve; ASTM D4751
8. UV-Stability: 70% retained strength; ASTM D4355 after 500 hours.

2.04 EROSION CONTROL BLANKETS

A. Erosion control blankets will not be used on this project. In lieu of these blankets, the Contractor will stabilize the seeded areas using straw crimped into the ground using a mulch anchoring tool (disc with vertical coulters) or by hydroseeding with a cellulose or wood fiber mulch.

2.05 BONDED FIBER MATRIX

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

B. Bonded fiber matrix will consist of:

1. Seed and Fertilizer per Section 32 92 19.
2. Wood Fiber Mulch: Thermo-mechanically defibrated long, softwood fibers manufactured from select northern softwood wood chips.
3. Polyacrylamide Binder: Site specific, fully biodegradable, polyacrylamides (PAM's) binders, with cross-linking long organic jute fibers

C. Materials will be mixed at the rate of 80 lbs per acre of PAM binder and 2500 lbs per acre of wood fiber mulch.

2.06 INLET FILTER FABRIC

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

B. Tensile Strength:80 lb - f minimum; ASTM D4632/D4632M

C. Elongation: 50 percent minimum; ASTM D4632/D4632M

D. CBR Puncture Strength: 300 lb - f minimum; ASTM D6241

E. Trapezoidal Tear: 70 lb - f minimum; ASTM D4533/D4533M

F. Flow Rate: 80 gal/min/sft minimum; ASTM D4491/D4491M

G. Permittivity: 1.4 sec -1 minimum; ASTM D4491/D4491M

H. Apparent Opening Size: 100 US std Sieve maximum; ASTM D4751

I. UV-Stability: 70% retained strength; ASTM D4355/D4355M after 500 hours.

2.07 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers include the following:

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

PART 3 EXECUTION

3.01 EXAMINATION

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

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

3.02 PREPARATION

A. Review the drawings and Storm Water Pollution Prevention Plan (SWPPP).

B. Revise SWPPP as necessary to address potential pollution from site identified after issuance of the SWPPP at no additional cost to Owner.

C. Conduct storm water pre-construction meeting with Site Contractor, all ground-disturbing Subcontractors, site Engineer of record or someone from their office familiar with the site and SWPPP, and state or local agency personnel in accordance with requirements of the special conditions.

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

3.03 GENERAL

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

B. Sedimentation control devices will be installed prior to Contractor beginning Work. Soil erosion and sedimentation control devices must be maintained in an effective functioning condition at all times during the course of the Work.

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

3.04 INSTALLATION - GENERAL

A. Install silt fences, ditch sediment traps, check dams, inlet filters, temporary gravel construction entrance/exits, turbidity barriers, erosion control blankets and other soil erosion control devices in accordance with the drawings and Storm Water Pollution Prevention Plan, or as may be dictated by site conditions in order to maintain the intent of the specifications and permits.

B. Deficiencies or changes on the drawings or SWPP must be corrected or implemented as site conditions change. Changes during construction must be noted in the SWPP and posted on the drawings.

C. Owner has authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and embankment operations and to direct Contractor to provide immediate permanent or temporary pollution control measures.

D. Remove temporary control devices after permanent measure are established. Remove and replace temporary control devices if they become ineffective at no additional cost to Owner.

E. Contractor will incorporate permanent erosion control features, paving, permanent slope stabilization, and vegetation into project at earliest practical time to minimize need for temporary controls.

F. Contractor will permanently seed and mulch cut slopes as excavation proceeds to extent considered desirable and practical.

3.05 DUST CONTROL

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

3.06 APPLICATION OF BONDED FIBER MATRIX

A. The slope will be prepared and graded prior to application of Bonded Fiber Matrix (BFM). Mixture of wood fiber mulch and polyacrylamide binder will be blended, with the appropriate amount of seed and fertilizer per Section 32 92 19, according to manufacturer's recommendations.

B. BFM will be hydraulically applied to the soil as a viscous mixture, crating a continuous, three-dimensional blanket that adheres to the soil surface. BFM will be mixed and applied at the rate as specified in this Section unless otherwise indicated on the Plans.

C. The resulting coverage must be at least 1/8 inch thick over the entire surface area. BFM will be applied in two applications from alternate directions to eliminate shadowing and will be applied when no rain is expected for 12 hours.

3.07 DEWATERING DISCHARGE

A. Should it be necessary for Contractor to do any dewatering during the course of construction, Contractor will filter discharge through a discharge filter bag or other sediment control device that will filter all discharge water.

B. No dewatering discharge will be allowed to flow unfiltered from the construction site.

3.08 MAINTENANCE

A. Maintain temporary erosion and sedimentation control systems as dictated by site conditions, indicated in the construction documents, or as directed by governing authorities or Owner to control sediment until final stabilization.

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

3.09 INSPECTION

A. General:

1. Contractor is responsible to obtain and/or serve as the Certified Operator.

    a. Weekly inspections are to be conducted by Contractor as a minimum, and after every rainfall event. A copy of the inspection report will be submitted to the agency having jurisdiction, as well as Owner and Engineer.

2. Inspections will be performed by a person familiar with the site, the nature of the major construction activities, and qualified to evaluate both overall system performance and individual component performance.

3. Inspector must either be someone empowered to implement BMPs in order to increase effectiveness to an acceptable level or someone with the authority to cause such things to happen.

4. Inspector must be certified as a “Storm Water Professional” through the EGLE storm water training program. Additionally, the inspector will be properly authorized in accordance with the applicable General Permit to conduct the certified site storm water inspections.

B. Inspection Frequency Reduction:

1. Inspection frequency may be reduced under the following conditions:

a. No active onsite construction activities.

b. Temporary cover has been provided across the entire site and no BMPs remain.

1) Situation: waiting for grass to grow, but grass is dormant.

c. Ground is frozen and/or snow covered.

C. Weekly Storm Water Meeting:

1. A weekly storm water meeting will be held by Contractor with those involved in ground-disturbing activities to review the requirements of the permits, the SWPPP, and address any problems that have arisen in implementing the SWPPP or maintaining the BMPs.

2. Contractor will maintain a log of weekly meetings and document the issues addressed in the meetings on site.

D. Agency Storm Water Inspections:

1. A log of inspections by federal, state, or local storm water or other environmental agencies will be kept in Contractor’s SWPPP.

2. The log form should include the date and time of visit and whether a report was issued or will be issued as a result of the inspection.

3. Any reports issued will be sent to Engineer within 24 hours.

3.10 PROJECT COMPLETION

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

END OF SECTION

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 TRANSPORTATION AND HANDLING

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

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

1.02 STORAGE AND PROTECTION

A. Store materials and equipment immediately on delivery, and protect it until installed in the Work.

B. Store products subject to damage by elements in weather-tight enclosures with temperature and humidity ranges as required by manufacturer's instructions.

C. Store loose granular materials on solid surfaces to prevent mixing with foreign matter.

D. Locate the place of storage so as to minimize interference with traffic and to provide easy access for inspection. Do not store materials closer than 5 feet (1.5 meters) to the edge of pavement or traveled way open to the public.

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

F. Provide protection of stored or installed materials and equipment as necessary to prevent damage from traffic and subsequent operations.

1.03 MANUFACTURER'S INSTRUCTIONS

A. Obtain and distribute copies of manufacturer's instructions when the Contract Documents require that installation of Work to comply with manufacturer's instructions. Distribute copies of such instructions to parties involved in the installation, as well as at least 1 copy to the Engineer.

B. Handle, install, connect, clean, condition and adjust products in strict accord with such instructions and in conformity with specified requirements. Should project conditions or specified requirements conflict with manufacturer's instructions, consult with Engineer for further instructions.

1.04 PRODUCTS LIST

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

1.05 CONTRACTOR'S PRODUCT OPTIONS

A. Select any product meeting the standard for products specified only by reference standard.

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

C. For products specified by naming one or more products or manufacturers and "or equal," tsubmit a Substitution Request Form for any product or manufacturer not specifically named, in accordance with Section 00 72 00 - General Conditions.

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

1.06 EQUIPMENT STARTUP AND TESTING

A. Perform a comprehensive startup and demonstration of equipment performance and compliance with the design requirements. When there is more than one mode of operation, the equipment will be operated in every mode to verify proper operation.

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

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

D. Equipment is to be inspected prior to operation for debris or other obstructions. Equipment is to be properly lubricated and calibrated prior to operation. Contractor will make adjustments necessary to ensure correct operation. When required, equipment installation and operation is to be witnessed and checked by manufacturer.

E. When required, the Contractor will train the Owner’s operation and maintenance personnel in the proper operation and maintenance of each piece of equipment and the system as a whole.

F. Equipment startup is to be witnessed by the Owner and the Engineer.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 CLEANING

A. Contractor will perform periodic cleaning to keep the Work, the site and adjacent properties free from accumulations of waste materials, rubbish and wind-blown debris, resulting from construction operations.

B. Waste material, debris and rubbish will be periodically removed from the site and disposed of at legal disposal areas away from the site.

C. Prior to Owner acceptance, Contractor will conduct an inspection of sight-exposed interior and exterior surfaces, and Work areas, to verify that the entire Work is clean.

D. Contractor will broom clean exterior paved surfaces and rake clean other exterior surfaces of the site.

1.02 PROJECT RECORD DOCUMENTS

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

1. Date
2. Project Title and Number
3. Contractors Name and Address
4. Title and Number of each Record Document
5. Certification that each Document as submitted is complete and accurate

B. Record Documents will include:

1. Annotations, including changes during the execution of the work resulting from Requests of Information, Field Orders, Change Directives, and the as-built conditions which differ from the proposed plans.

    a. Annotations will include dimensional changes from the proposed plans. Where different from the proposed plans, strike through the proposed dimension and provide the as-built dimension. Changes will be clouded.

    b. Annotations may also be accompanied by sketches, photos, etc., as appropriate, to demonstrate as-built information or conditions.

2. Underground utilities installed as part of the Project and utilities exposed during execution of the Work. Underground utilities will be surveyed to record their location and elevation. Utiliity locations will be based upon available Project data (i.e., coordinate system, benchmarks, etc.).

    a. The utility information will include:

1) Straight run data every 100-feet.

2) Bends, valves, fittings, wyes/tees, hydrants, etc.

3) Crossings of other utilities.

C. Record documents will be in Portable Document Format (pdf), full size (i.e., 22" x 34"), in good order and in a legible condition.

D. Prior to delivery of the project record documents, Contractor will submit draft updates on a monthly basis to Engineer for review.

1.03 OPERATION AND MAINTENANCE DATA

A. Prior to final inspection or acceptance, Contractor will fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of products, equipment and systems specified in the Contract Documents.

B. Operation and maintenance data required by the individual Specification sections and the manufacturer's operation and maintenance data required in Section 01 33 00 - Submittal Procedures, will constitute the basis of such instruction.

1.04 START UP

A. Contractor will coordinate efforts between Owner, Engineer, any equipment manufacturers, subcontractors and governing agencies in the start up of applicable portions of the Work.

1.05 WARRANTIES

A. Provide written warranties from the manufacturerfor major equipment supplied under this Contract. The manufacturer’s warranty period will be concurrent with the Contractor’s warranty period. The warranty from the manufacturer will not relieve the Contractor of the one-year warranty starting at the time of Project Substantial Completion. Owner can request written warranties for equipment not classified as major.

1.06 SUBSTANTIAL COMPLETION

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

1.07 FINAL PAYMENT AND ACCEPTANCE

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

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 89 00 - SITE CONSTRUCTION PERFORMANCE REQUIREMENTS

PART 1 GENERAL

1.01 SCOPE OF WORK

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

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 57 13 - Temporary Erosion and Sediment Control

B. Section 31 23 13 - Subgrade Preparation

C. Section 31 23 16 - Structural Excavation and Backfill

D. Section 31 23 19 - Dewatering

E. Section 31 23 33 - Trenching and Backfilling

F. Section 32 12 16 - Bituminous Paving

G. Section 32 13 13 - Concrete Paving

H. Section 32 13 15 - Sidewalks and Driveways

I. Section 32 92 19 - Seeding

J. Section 32 92 23 - Sodding

1.03 REFERENCE STANDARDS

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

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

2. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort

1.04 REQUIREMENTS OF REGULATORY AGENCIES

A. Comply with Section 01 57 13 - Temporary Erosion and Sediment Control. Contractor, at Contractor's expense, will secure all permits, and post all bonds or deposits required to comply with the Soil Erosion and Sedimentation Control, requirements, being Part 91 of PA 451 of 1994 as amended.

B. Comply with all requirements of theNational Pollutant Discharge Elimination System (NPDES) Storm Water Program for Construction Activities, Part 31 of PA 451 of 1994 as amended.

C. Provide, maintain and remove such temporary and/or permanent Soil Erosion and Sedimentation Control (SESC) measures as specified on the Plans or as determined by the Engineer.

1. Measures will prevent surface runoff from carrying excavated materials into the waterways, reduce erosion of the slopes, and prevent silting in of waterways downstream of the Work.

2. Measures should include provisions to reduce erosion by the wind of areas stripped of vegetation, including material stockpiles.

1.05 SUBMITTALS

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

1.06 PROTECTION OF PLANT LIFE

A. Trees, shrubs, and other types of vegetation not within the limits of the Work or not designated on the Plans or by the Engineer to be removed, will be carefully protected from damage or injury during the various construction operations.

B. Trees, shrubs or other types of vegetation not designated to be removed but which is damaged by the Contractor's operation will be repaired or replaced by the Contractor, at Contractor's expense, as determined by the Engineer.

1.07 PROTECTION OF EXISTING STRUCTURES AND IMPROVEMENTS

A. Carefully protect existing culverts, sewers, drainage structures, manholes, water gate wells, hydrants, water mains, utility poles, overhead lines, underground conduits, underground cables, pavement, or other types of improvements within the construction limits, not designated on the Plans to be removed from damage during the construction operations.

B. Repair or replace existing structure or improvement not designated to be removed that are damaged by the Contractor's operations to the satisfaction of the structure owner, at Contractor's expense.

C. Deposits of dirt or debris in sewers, culverts, tiles, drainage structures, manholes, gate wells, etc. caused by the Contractor at the Contractor’s expense.

1.08 MAINTAINING DRAINAGE

A. Maintain existing open drains, field and roadway ditches, drainage tile, sewers, enclosed drains, natural and artificial watercourses, surface drainage or any other types of drainage within the limits of the Work to for continued free discharge during construction. Costs incurred will be incidental to the excavating, backfilling and compacting or grading operations.

B. Repair or replace drainage facilities not designated to be abandoned, but which are damaged, or interrupted by the Contractor's operation immediately at Contractor's expense.

PART 2 PRODUCTS

2.01 GRANULAR MATERIAL

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

2.02 AGGREGATE FOR SHOULDERS, PARKING AREAS, DRIVEWAYS OR ROADS

A. Crushed limestone, natural aggregate or slag msut meet the requirements MDOT Section 902.

PART 3 EXECUTION

3.01 DEWATERING

A. Dewater the area within the vicinity of the new Work prior to commencing any construction activities. The depth of the dewatering will be sufficient to allow the Work area to remain in a dry condition during the various construction operations.

B. The costs incurred for furnishing, installing, maintaining and removing the dewatering equipment will be at the Contractor's expense unless otherwise specified.

C. Refer to Section 31 23 19 - Dewatering for additional requirements.

3.02 GENERAL

A. Construction operations will be restricted to the existing right-of-way or the areas indicated on the Plans. If the Contractor requires additional area, the Contractor must furnish the Engineer with written permission obtained from the property owner for any part of the operation the Contractor plans to conduct outside of the right-of-way or limits indicated.

1. Permission must be granted by the property owner prior to commencing any construction activities or operations outside of the existing right-of-way or designated areas.

3.03 EXISTING IMPROVEMENTS

A. Expose existing sewers and structures to which the new Work is to be connected and notify the Engineer once exposed. Engineer will verify the vertical and horizontal locations of the existing system and will inform the Contractor as to the necessary adjustments required to align the new Work with the existing system.

3.04 EXISTING UTILITIES

A. When existing utilities are shown on the Plans, their locations are approximate only, as secured in the field investigation and/or from available public records. Contractor, prior to the start of construction, must contact 811 and the public agency or utility having jurisdiction to request the verification of all utilities within the construction area.

B. When existing utility lines, structures or utility poles are encountered during the performance of the Work, the Contractor, at Contractor's expense, will perform construction operations in such a manner that the service will be uninterrupted.

C. Expose all existing utility lines prior to any excavation operation, to determine any conflict with the proposed improvement. Contractor is responsible for any relocation required as a result of any conflict of existing utilities shown on the Plans, with the proposed improvement.

D. Should it become necessary to move any utility structure, line or pole shown on the Plans or otherwise found necessary to be moved, the Contractor will make all arrangements with the owner of the utility for the moving. Costs incurred for such moving will be at the Contractor's expense unless indicated otherwise.

1. Before disturbing a utility line, structure or pole, furnish the Engineer with satisfactory evidence, in writing, that proper arrangements have been made with the owner of the utility.

3.05 UTILITY POLES

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

B. Arrangements for removing or relocating utility poles with the owner of the utility pole will be the Contractor's responsibility.

C. Prior to disturbing any utility pole, the Contractor will provide the Engineer with written evidence that proper arrangements have been made with the owner of the utility pole.

D. When required by the Work, Contractor will temporarily support poles in the vicinity of the Work, or make arrangement for the utility power owner to temporary support the poles, at no additional cost to the Owner.

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

3.06 EXISTING SEWERS, TILE, AND MAINS

A. Restore existing sanitary sewers, storm sewers, drain tile, septic tank bed tiles, water mains or building services or leads, that are encountered during the performance of the Work that require relocation or are damaged with new materials equal in quality and type to the materials encountered.

B. Installation of new materials will be as specified in the Contract Documents or in accordance with the agency having jurisdiction. Bedding and backfill material, unless otherwise specified, will be Class II granular material, compacted to 95% of its maximum unit weight, and approved by the Engineer.

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

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

3.07 EXISTING STRUCTURES

A. Existing surface and subsurface structures may be shown on the Plans, in locations considered most probable from information secured in the field investigation or from available public records.

B. Neither the correctness nor completeness of such information is guaranteed or implied.

C. Structures will be protected, preserved or restored by the Contractor, to the satisfaction of the structure owner, at no additional cost to the Project.

3.08 EXISTING BUILDINGS

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

B. When it becomes necessary for the Contractor to move one of these buildings or structures in order to proceed with construction, the Contractor, at Contractor's expense, will exercise all due care in moving the building or structure to prevent undue damage.

C. Prior to moving an existing building or structure, the Contractor will furnish the Engineer with satisfactory evidence, in writing, that proper arrangements have been made with the owner.

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

3.09 REMOVAL OF SEWERS AND CULVERTS

A. Unless otherwise specified in the Contract Documents, the Contractor, at Contractor's expense, will remove abandoned culvert, pipe, sewer, structure or part of a structure which is to be replaced or rendered useless by the new construction.

B. When a sewer or culvert is removed at a structure, the Contractor will install a masonry bulkhead in the structure.

C. Removal of a culvert or sewer also includes the removal and disposal of any end treatments or headwalls.

3.10 REMOVAL OF STRUCTURES

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

B. If a structure is to be removed from a system that is to remain in service, a bypass system, approved by the Engineer, will be installed and maintained by the Contractor, during the rebuilding period.

3.11 ABANDONING STRUCTURES

A. Demolish Break the structure down to at least 30 inches below the subgrade.

B. Pipes connected to the structure will be plugged with a brick, masonry or concrete bulkhead approved by the Engineer.

C. Backfill the structure with flowable fill to 12 inches above the pipes and the remainder of the structure backfilled with sand-cement mixture at a 10 to 1 ratio to subgrade elevation or to 12 inches below finished grade.

D. Backfill the remainder of the excavation with a granular material, compacted to 95% of its unit weight, and will meet with the approval of the Engineer. Maximum unit weight will be determined by ASTM D698, Method B.

3.12 SALVAGED MATERIAL

A. Salvaged materials will become the property of the Contractor unless otherwise specified in the Contract Documents, and will be disposed of by the Contractor, at Contractor's expense.

3.13 CROP DAMAGE

A. In areas where crops are encountered along the route of the construction, the Contractor will prepare a written agreement between the Contractor and the crop owner as to the type and nature of the crop that may be damaged during construction activities prior to the start of any construction activities within the area.

B. Contractor will be responsible for making full reimbursement to the owner of the crop damage on the basis of the following procedure:

1. The area of the crop damage will be determined by measurements taken by the Engineer, and this area will include those portions of the crop which may extend into the public right-of-way.

2. The County Office of the U.S. Agricultural Extension Service will establish the average yield of the crop.

3. The cost of the crop will be determined by using the prevailing price at the time of harvest as furnished by the U.S. Agricultural Extension Service.

C. Contractor will furnish the Engineer with satisfactory evidence that payment for crop damage was made, prior to receiving final payment on the Project.

3.14 REMOVE AND REPLACE TREE

A. Tree removal and replacement may be accomplished in two ways.

1. Contractor may completely remove and dispose of the existing trees, and after the new improvement has been completed, tested, accepted and rough grading has been completed, the Contractor will plant new trees, in approximately the same location as the existing trees, of size and species per the landscaping plans included in the Plans.

2. Contractor may remove and preserve the existing trees.

a. Trees will be properly cared for and maintained in a healthy condition.

b. After the new improvement has been installed, tested, accepted and rough grading completed, the trees wll be replanted in approximately the same location.

c. Any trees damaged, destroyed or which die, will be replaced at no additional cost.

B. Trees, whether replanted or planted new, will be guaranteed for a period of one year(s) from the date of Substantial Completion.

3.15 REMOVING PAVEMENT

A. Removal of concrete and bituminous pavement, as called for on the Plans, consists of removing and disposing of pavement and will include base courses, surface courses, integral and separate curbs, integral and separate curb and gutters, sidewalks and end headers.

B. Remove pavement to an existing joint or cut parallel to existing pavement joints.

C. Use a power-driven concrete saw, approved by the Engineer, to make cuts. The depth of the saw cut will be a minimum of 6 inches to ensure that the removal of the old pavement will not disturb or damage the section of pavement remaining in place.

D. Residual concrete pavement will not be less than 5 feet measured transversely, nor less than 6 feet longitudinally measured from a joint.

E. In removing a concrete base course, where part of the existing bituminous surface is to remain in place, cut the full depth of the bituminous surface with a power-driven saw, approved by the Engineer, along a line parallel to and at least 12 inches from either side of the base course removal.

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

G. Removal of Curb for Curb Drop:

1. Where curb is to be removed for a curb drop, the operation will be performed either by saw cutting or by cold milling that has been approved by the Engineer, so as to leave a neat surface with a maximum 1 inch lip, without damage to the underlying pavement.

H. Removal of Curb and Gutter:

1. Where curb and gutter are to be removed, the operation will be performed by saw cutting. The limits of the removal will be as shown on the Plans or as approved by the Engineer. However, in no case will the width of removal be less than 18 inches for sections with rolled or straight curb or less than 24 inches for mountable curbs.

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

J. Earth removed during the pavement removal operation will be replaced by backfilling to the proposed subgrade with a suitable material, approved by the Engineer, at the Contractor's expense.

3.16 GUARDRAIL

A. Relocate or remove beam guardrail as specified on the Plans or as determined by the Engineer. If the existing material is damaged or destroyed, the Contractor will replace the material at Contractor's expense.

B. Where guardrail is encountered during construction and is removed by the Contractor when its removal was not called for on the Plans, the guardrail will be replaced or restored, at the Contractor's expense, to a condition comparable to that prior to construction.

C. After the guardrail removal or relocation operations are complete, surplus material will be removed and disposed of by the Contractor, at Contractor's expense, unless otherwise called for in the Contract Documents.

D. Backfill holes or voids resulting from the guardrail removal operation with a Class II granular material that has been approved by the Engineer.

3.17 FENCES

A. Remove and replace fences as indicated on the Plans. If any of the existing material is damaged or destroyed during the Contractor's activities, the Contractor will replace the damaged material at Contractor's expense.

B. Where fencing is encountered during construction and removed by the Contractor when its removal was not called for on the Plans, the fenceing will be replaced or restored, at the Contractor's expense, to a condition comparable to that prior to construction.

C. After the fence removal or relocation operations are complete, surplus material will be removed and disposed of by the Contractor, at Contractor's expense, unless otherwise called for in the Contract Documents.

D. Backfill holes or voids resulting from the fence removal operation with a suitable material that has been approved by the Engineer.

E. Where fences are encountered that are being used to confine livestock or to provide security, the fence must be immediately replaced following construction. During construction, the Contractor, at Contractor's expense, must provide, install and maintain a temporary fence that has been approved by the Engineer.

3.18 HOLES

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

B. Furnishing, placing and compacting of the backfill material will be at the Contractor's expense.

3.19 RESTORATION IN RIGHT-OF-WAY AND YARD AREAS

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

B. Excess material from the restoration operation will be disposed of by the Contractor at Contractor's expense.

C. Grade disturbed areas to receive either topsoil and seed or topsoil and sod. Topsoil, seed, sod, fertilizer and mulch must conform to the requirements specified on the Plans and in Section 32 92 19 or 32 92 23.

D. Contractor, at Contractor's expense, will furnish, place, and compact any additional fill, meeting the approval of the Engineer, needed to restore the disturbed areas to the cross sections called for on the Plans or as determined by the Engineer.

3.20 RESTORATION OF AGGREGATE SURFACES

A. Shoulders:

1. Shoulders will be regarded as the area between the edge of pavement and the ditch, or the area within 10 feet of the pavement, whichever is the lesser.

2. Backfilling of trenches in the shoulder area will be carried to within 5 inches of the existing surface as specified under Trench “A" or Trench "B" of Section 31 23 33. Backfill the

remaining depth with a minimum of 5 inches of compacted 22A or 23A aggregate with calcium chloride applied, at the rate of 6 pounds per ton of aggregate.

3. Contractor, at Contractor's expense, will furnish, place and compact materials necessary to complete the backfilling and restoration operation within the shoulder area.

B. Driveways and Parking Areas:

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

2. Backfilling of trenches crossing aggregate surfaced driveways and parking areas will be carried to the bottom of the proposed base course as specified under Trench “B”. Backfill the remaining depth with a minimum of 6 inches of compacted 22A or 23A aggregate, with calcium chloride applied at the rate of 6 pounds per ton of aggregate.

3. Aggregate surfaced areas beyond the limits of the actual excavation which are disturbed, as determined by the Engineer, by such operations as temporary storage of materials or passage of equipment, will be resurfaced, at the Contractor's expense.

a. The upper three 3 inches of disturbed areas will be removed as necessary to allow the final elevation of the resurfacing course to be at the elevation of the drive or parking area which existed prior to excavation.

b. Disturbed area will be resurfaced with a minimum of 3 inches of 22A or 23A compacted aggregate, with calcium chloride applied at the rate of of aggregate.

4. Contractor, at Contractor's expense, will furnish, place, and compact all materials necessary to complete the backfilling and restoration operations within the driveway and parking area.

C. Roads and Streets:

1. Backfilling of trenches crossing aggregate surfaced roads or streets will be carried to within 12 inches of the existing surface as specified under Trench "B" of Section 31 23 33 - Trenching and Backfilling. The remaining depth will be backfilled with two 6 inches layers of compacted 22A or 23A aggregate, with calcium chloride applied at the rate of 6 pounds per ton of aggregate.

2. Contractor, at Contractor's expense, will furnish, place, and compact materials necessary to complete the backfilling and restoration operations within the roadway or street area.

3. Settlement of the aggregate surface will be restored by placing additional aggregate, up to the original grade, and will be at the Contractor's expense.

D. Compaction

1. Compaction of aggregate will be performed by a pneumatic-tired roller or a vibratory compactor until the material forms a stable surface.

3.21 RESTORATION OF PAVED SURFACES

A. Contractor will furnish and provide the materials necessary to complete the backfilling and restoration operations, which includes furnishing, compacting, forming, placing, rolling, floating, jointing, finishing, curing and providing protection against elements.

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

C. Concrete:

1. The backfilling of trenches crossing concrete driveways, sidewalks, roads, streets or parking areas will be carried to the bottom of the proposed pavement as specified under Trench "B" of Section 31 23 33 - Trenching and Backfilling.

2. Unless otherwise specified on the Plans or as determined by the Engineer, concrete removed will be replaced with 3500 psi concrete of the thickness removed and will include reinforcing equal to the existing, if the existing pavement was reinforced.

3. Construction of concrete pavements will be in accordance with Section 31 23 33 - Trenching and Backfilling.

4. Restoration of sidewalks includes the construction of sidewalk ramps at the intersection of the curb and must conform to the current rules and regulations of the state of Michigan, and Section 32 13 15 - Sidewalks and Driveways. Unless otherwise indicated in the Proposal, this Work will be considered incidental to the Project.

D. Bituminous

1. The backfilling of trenches crossing bituminous driveways, sidewalks, roads, streets or parking areas will be carried to the bottom of the base course as specified under Trench "B" of Section 31 23 33 - Trenching and Backfilling.

2. Bituminous pavement or bituminous surface course with an aggregate base will be replaced in accordance with Section 32 12 16 - Bituminous Paving.

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

4. Restoration of any bituminous chip seal shoulders that are damaged or partially damaged, as determined by the Engineer, will include complete replacement full width and length (extending a minimum of 25 feet beyond the damaged area both ways). Existing bituminous chip seal shoulders will be brought to proper grade with compacted 22A or 23A aggregate and resurfaced with a double chip seal per Section 32 12 16 - Bituminous Paving.

3.22 SOIL EROSION AND SEDIMENTATION CONTROL

A. Contractor will comply with the requirements of Section 01 57 13. Prior to commencing any type of earthwork, the Contractor will obtain a Soil Erosion and Sedimentation Control permit from the local enforcing agency.

B. Contractor will obtain approvals, secure permits and post bonds and deposits required to comply with the Soil Erosion and Sedimentation Control Act, Part 91 of PA 451 of 1994, as amended, and those of the enforcing agency.

C. Contractor will provide the Engineer with a copy of the soil erosion permit issued by the local enforcing agency for the Project, prior to commencing any type of earthwork on the Project.

3.23 EXCESS EXCAVATION

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

B. Contractor, when requested by the Owner, will transport excess excavation to a site(s) designated by the Owner.

1. Excess excavation will be graded by the Contractor to provide positive surface drainage of the site(s).

2. Grading will be done such that adjacent properties are not damaged or affected. The grading will include removal of all surface irregularities to provide a smooth surface ±3 inches.

C. When the excess excavation has not been requested by the Owner, the Contractor will remove and properly dispose of the material at no additional cost to the Owner.

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

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

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

END OF SECTION

SECTION 03 15 00 - CONCRETE ACCESSORIES

PART 1 GENERAL

1.01 SCOPE OF WORK

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

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 11 00 - Concrete Forming

B. Section 03 20 00 - Concrete Reinforcing

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

1.03 REFERENCE STANDARDS

A. ASTM A193/A193M - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications

B. ASTM A194/A194M - Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both

C. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts

D. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel

E. ASTM D994/D994M - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)

F. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

G. ASTM D1752 - Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction

H. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

I. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions

J. COE CRD-C 513 -Handbook for Concrete and Cement Corps of Engineers Specifications for Rubber Waterstops

K. COE CRD-C 572 - Handbook for Concrete and Cement Corps of Engineers Specifications for Polyvinylchloride Waterstop

1.04 SUBMITTALS

A. Submit certified manufacturer's affidavits for expansion joint filler, joint sealant and waterstops to verify compliance with the applicable Specifications.

B. Submit a schedule of concrete pouring and indicate locations of proposed construction and expansion joints. This schedule is subject to approval of the Engineer.

1.05 ENVIRONMENTAL REQUIREMENTS

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

1.06 SEQUENCING

A. Contractor will sequence installation of miscellaneous embedded items with the Work of Section 03 11 00, Section 03 20 00 and Section 03 30 00.

PART 2 PRODUCTS

2.01 JOINT FILLER

A. Preformed Expansion Joint Filler for Concrete (Bituminous Type) ASTM D994/D994M.

B. Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types) ASTM D1751.

C. Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Concrete ASTM D1752.

2.02 JOINT SEALER

A. Joint Sealants, Hot-Poured, For Concrete and Asphalt Pavements ASTM D6690 Type II.

B. Joint Sealants, Hot-Poured, Elastomeric Type, for Portland Cement Concrete Pavements ASTM D6690, Type II or III.

2.03 WATERSTOPS

A. PVC waterstops will conform to COE CRD-C 572 polyvinyl chloride (PVC) or COE CRD-C 513 styrene-butadiene rubber (SBR). Use flat ribbed type in joints in walls and slabs where shown on the Drawings. Use center bulb type in expansion joints.

B. Bentonite waterstops will be a compound of 75% high swelling sodium bentonite and 25% butyl rubber. Bentonite waterstops require an adhesive as recommended by the manufacturer to adhere the waterstop to the substrate.

C. Hydrophilic rubber waterstop will be a combination of chloroprene rubber and chloroprene rubber modified to impart hydrophilic properties. The waterstop will have a delay coating to inhibit initial expansion due to moisture present in fresh concrete. Hydrophilic rubber waterstops require an adhesive as recommended by the manufacturer to adhere the waterstop to the substrate.

2.04 CONCRETE ANCHORS

A. General:

1. Select type and size to achieve required loading capacity using information provided by manufacturer. If required type is not indicated, select type appropriate to conditions and item being fastened.

2. Maintain critical edge distance and spacing per manufacturer’s recommendations for all anchors. Provide tamper proof hardware when called for on the plans.

B. Adhesive Anchors:

1. Combination capsule adhesive and insert system; chisel pointed threaded rod with hex nut/washer, reinforcing bar, or internally threaded insert, installed into pre-drilled anchor hole using rotary hammer drill, crushing glass capsule containing two part epoxy acrylate resin (vinyl ester) with quartz aggregate and hardening agent, forming adhesive mortar.

2. Threaded rod: ASTM A193/A193M Grade B7, ASTM A194/A194M Grade 2H or ASTM A563/A563M Grade DH nuts, and ASTM F436/F436M washers; plated in accordance with ASTM B633, SC1, with Type II yellow chromate treatment or Type 304 stainless steel when specified on the plans.

3. Threaded Insert: Carbon steel tubular insert, internally threaded, plated in accordance with ASTM B633, SC1.

C. Wedge Type Anchors:

1. One piece body with expansion mechanism installed in pre-drilled hole using matching tolerance bit.

2. Carbon steel anchor body, washers, nuts and wedges, plated in accordance with ASTM B633, SC1, Type III or Type 304 stainless steel anchor body, washers, nuts and wedges when so indicated on plans.

PART 3 EXECUTION

3.01 CONTRACTOR'S VERIFICATION

A. Inspect the locations and surfaces to receive joint filler, joint sealer, or miscellaneous embedded items and correct defects or conflicts which will affect the proper performance of the item to be placed.

3.02 PREPARATION

A. Accessories to be embedded into concrete with contact surfaces are to be free of dirt, curing compound, protrusions of hardened concrete or any other foreign material which would affect bond with concrete.

B. Prime surfaces in accordance with manufacturer's recommendations.

3.03 INSTALLATION OF JOINT FILLERS

A. Details, including materials and methods of installation of joint fillers will be as indicated on the Plans and as approved by the Engineer.

3.04 INSTALLATION OF JOINT SEALANTS

A. Do not seal joints when the sealant, air or concrete temperature is less than 40 degrees Fahrenheit. Install bond breaker and backup material where required, as indicated on the Plans, or in accordance with the manufacturer's recommendations.

3.05 INSTALLATION OF WATERSTOPS

A. Waterstops will be of maximum practicable length to minimize joints.

B. Position waterstops will be positioned as indicated on the Plans in a manner to permanently retain flexibility.

C. Splice in length or at intersections by heat sealing in accordance with manufacturer's recommendations.

D. Reform splices with a remolding iron with ribs or corrugations to match the pattern of the waterstop. When cooled and bent by hand in as sharp as an angle as possible, the splice will show no sign of separation.

E. Provide support and protection of the waterstops during the progress of the work. Replace or repair waterstops that are punctured or damaged at Contractor's expense. Concrete will be thoroughly consolidated in the vicinity of the waterstop. Provide suitable guards to protect exposed projecting edges and ends of partially embedded waterstops from damage when concrete placement has been discontinued.

3.06 CONCRETE ANCHORS

A. Do not begin installation until substrates have been properly prepared. Do not proceed with installation if substrate preparation is unsatisfactory.

B. Clean surfaces thoroughly prior to installation. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Install in accordance with manufacturer's instructions and recommendations and as required by applicable code. Anchor applied items neatly, with item mounted plumb and level unless otherwise indicated.

D. Engineer reserves the right to require the anchor manufacturer's representative to demonstrate proper installation procedures for post-installed anchors and to observe Contractor's installation procedures, at no extra cost to Owner. Engineer reserves the right to require pullout or shear tests to determine adequacy of anchors, at no extra cost to Owner.

3.07 MISCELLANEOUS EMBEDDED ITEMS

A. Place inserts and other embedded items required for adjoining Work or for its support prior to concreting.

B. Position embedded items accurately and supported against displacement. Fill voids in sleeves, inserts, and anchor slots temporarily with readily removable material to prevent the entry of concrete into the voids.

END OF SECTION

SECTION 03 20 00 - CONCRETE REINFORCING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes the furnishing, fabrication, placement and care of material used as concrete reinforcement.

B. Latest or current American Concrete Institute (ACI) standards and code requirements for concrete and reinforced concrete will govern concrete Work except where otherwise specified herein. Copies of standards can be obtained from the ACI.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 11 00 - Concrete Forming

B. Section 03 15 00 - Concrete Accessories

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

1.03 ALLOWABLE TOLERANCES

A. Fabrication:

1. Sheared length: ±1 inch
2. Depth of truss bars: +0, -1/2 inch
3. Stirrups, ties, and spirals: ±1/2 inch
4. Other bends: ±1 inch.

B. Placement:

1. Concrete cover to form surfaces: ±1/4 inch
2. Minimum spacing between bars: -1/4 inch
3. Top bars in slabs and beams:
    a. Members8 inches deep or less: ±1/4 inch
    b. Members more than 8 inches but not 24 inches over deep: ±1/2 inch
    c. Members more than 24 inches deep: ±1 inch
4. Crosswise of members: Spaced evenly within 2 inches of stated separation.
5. Lengthwise of members: ±2 inches
6. Maximum bar movement to avoid interference with other reinforcing steel, conduits, or embedded items: 1-bar diameter, with approval from the Engineer.

1.04 SOURCE QUALITY CONTROL

A. Reinforcing steel will be subject to inspection at the source of supply, fabricator, or after delivery to the Project Site at the discretion of the Engineer.

B. Contractor may be required to furnish additional test of reinforcing steel for each 100 ton or fraction thereof. Testing for bend, pull, elongation and weight to assure compliance with specifications will be in accordance with ASTM A370.

1.05 REFERENCE STANDARDS

A. ACI SP-66: ACI Detailing Manual

B. ACI 301: Specifications for Concrete Construction

C. ACI 318: Building Code Requirements for Structural Concrete and Commentary.

D. ASTM A184/A184M: Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement

E. ASTM A370: Standard Test Methods and Definitions for Mechanical Testing of Steel Products

F. ASTM A615/A615M: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

G. ASTM A706/A706M: Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement

H. ASTM A996/A996M: Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement

I. ASTM A1064/A1064M: Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

J. ASTM C55: Standard Specification for Concrete Building Brick.

K. ASTM E329: Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

L. CRSI (DA4): Manual of Standard Practice

1.06 SUBMITTALS

A. Submit shop drawings that indicate the size and dimensions for fabricating and placing reinforcing steel. Include bar schedules, stirrup spacing, and the diameter of bend bars. Indicate the type and grade of bar supports.

B. Submit the manufacturer's laboratory test certificates. These certificates must identify the chemical and physical analysis of each load of reinforcing steel that's delivered.

C. Submit test certificates from a qualified independent testing agency. These certificates should document the agency's evaluation of the mechanical splice devices, ensuring they comply with ACI 318.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver reinforcement to Project site in bundles tagged and marked in accordance with CRSI (DA4).

B. Store reinforcing steel above ground on platforms or other supports, in an orderly manner to facilitate inspection and checking, and be protected from physical injuries or contamination.

1.08 SEQUENCING

A. Coordinate the placement of reinforcing steel so it doesn't prevent the proper and timely completion of dependent construction phases.

PART 2 PRODUCTS

2.01 REINFORCING BARS

A. Use reinforcement of the grade and type as specified herein unless otherwise indicated on the Plans or Shop Drawing.

B. Bars:

1. Deformed and Plain Billet-Steel Bars: ASTM A615/A615M, Grade 60.
2. Rail-Steel and Axle Steel Deformed and Plain Bars: ASTM A996/A996M, Grade 60.
3. Low Alloy Steel Deformed Bars: ASTM A706/A706M.

C. Mats:

1. Ensure fabricated steel bar or rod mats of the clipped type conform to ASTM A184/A184M.

2.02 WELDED WIRE FABRIC

A. Use welded wire fabric in flat mats only.

B. Plain:

1. Conform to ASTM A1064/A1064M, 6 x 6 – w2.9 x w2.9 unless otherwise indicated on the Plans.

C. Deformed:

1. Conform to ASTM A1064/A1064M, 6 x 6 – w2.9 x w2.9 unless otherwise indicated on the Plans.

2.03 TIE WIRE

A. Plain:

1. Conform to Cold Drawn Steel Wire for Concrete Reinforcement ASTM A1064/A1064M, 16-gauge minimum size.

B. Deformed:

1. Conform to Deformed Steel Wire for Concrete Reinforcement, ASTM A1064/A1064M, size D-4 minimum.

2.04 BAR SUPPORTS

A. Fabricate metal bar supports from cold-drawn steel wire in accordance with current CRSI Standards.

B. For stainless steel supports, use Type 1. Attach stainless steel wire, conforming to ASTM A493, to the tips of the support. This ensures the non-stainless wire will be no closer than 1/4 inch from the form surface.

C. Use Type 1 plastic-coated supports. Ensure the plastic coating on the legs and tips is polyethylene, conforming to ASTM D1248.

D. Ensure precast concrete brick supports conform to ASTM C55, Type 1, Grade N.

2.05 FABRICATION

A. Bend bars cold to the shapes and dimensions shown on the Plans, or as required by the current "Manual of Standard Practice" of the CRSI. Do not bend or straighten steel in a way that injures the material. Do not use bars with kinks or improper bends.

B. For standard hooks, excluding stirrups and tie hooks, the diameter of the bend, measured on the inside of the bar, must meet or exceed the values in the following table.

Minimum Diameters of Bend	
Bar Size	**Minimum Diameter**
#3 through #8	6 bar diameters
#9, #10 and #11	8 bar diamters
#14 and #18	10 bar diameters

C. For stirrups and ties using number #5 bar and smaller, bends must be at least four bar diameters. For bars larger than No.#5, refer to the “Minimum Diameter of Bend” table above for bend requirements.

D. Ensure bends for stirrups and ties for welded wire fabric are at least 4-bar diameters for deformed wire larger than D-6, and at least 2-bar diameters for all other wires. If a bend has an inside diameter of less than 8-bar diameters, ensure it's at least 4-bar diameters from the nearest welded intersection.

PART 3 EXECUTION

3.01 CONTRACTOR'S VERIFICATION

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

3.02 PREPARATION

A. Remove dirt, grease, oil, loose mill scale, excessive rust, and foreign matter that will reduce bond with concrete or splicing method.

B. Cut the ends of bars to be butt spliced square and smooth.

3.03 INSTALLATION - GENERAL

A. Place reinforcing as indicated on the approved Shop Drawings, within allowable tolerances. Use bar supports, as shown on the approved Shop Drawings or in the Specifications, to properly separate and support the reinforcing steel.

3.04 MINIMUM COVER AND SPACING

A. Unless the Plans indicate otherwise, maintain the following minimum bar spacing:

B. For footings and other principal structural members where concrete is deposited against the ground, ensure 3 inches of concrete between the bar and the ground contact surface.

C. Protect concrete surfaces that will be exposed to weather, in contact with the ground, or in contact with liquids after form removal with 2 inches of concrete.

D. For reinforcement at surfaces not directly exposed to the ground, liquids, or weather, provide a concrete protective covering of 3/4 inch for slabs and walls, and 1-1/2 inches for beams and girders.

E. Protect column spirals or ties everywhere with a concrete covering cast monolithically with the core. Ensure this covering is at least 1-1/2 inches thick.

F. Ensure concrete protection for reinforcement is always at least equal to the diameter of bars, except for concrete slabs as noted above.

G. Maintain a minimum center-to-center distance between parallel bars of 2-1/2 times the diameter of the bars. Ensure the clear spacing between bars is never less than 1 inch, nor less than 1-1/3 times the maximum size of the coarse aggregate. Ensurehe maximum center to center distance in parallel bars is 18 inches.

H. When placing reinforcement in beams and girders in two (2) or more layers, the clear distance between layers must be at least 1 inch. Also, place the bars in the upper layers directly above those in the bottom layer.

I. For welded wire fabric designated as load-carrying reinforcement, overlap successive mats where continuous. Ensure the overlap, measured between the outermost cross wires of each fabric sheet, is no less than the spacing of the cross wires plus 2 inches. Support it as required for reinforcing bars.

3.05 SPLICING

A. Avoid splices at points of maximum stress. Splice bars in accordance with ACI 318.

B. Splice bars by overlapping in accordance with ACI SP-66. Securely lace them with wire unless the Plans or approved Shop Drawings indicate otherwise.

C. Lap adjoining wire mesh by no less than one (1) full mesh and lace securely with wire. Offset end laps in adjacent widths to prevent continuous splice.

D. Overlap successive mats of welded wire fabric reinforcement wherever they are continuous. The overlap, measured between the outermost cross wires of each fabric sheet, must be no less than one full mesh spacing plus 2 inches. Extend the fabric across supporting beams and walls and to within four 4 inches of concrete edges. It may extend through contraction joints where alternate wires are field cut. Adequately support the fabric during concrete placement to ensure its proper position in the slab either by the methods of Part 3 of this Section or by laying the fabric on a layer of the fresh concrete of the correct depth before placing the upper layer of the slab.

E. Offset vertical bars in columns by at least 1-bar diameter at lapped splices. To ensure proper placement, furnish templates for all column dowels.

F. For bars size #14 and #18 or larger, where size #11 bars are butt spliced to larger sizes, and/or when approved by the Engineer, weld them with full penetration butt welds in accordance with ACI 301. Adequate jigs and clamps or other devices must be provided by the Contractor to support, align and hold the longitudinal centerline of the bars in a straight line.

G. Bars larger than #11 may be butt spliced by mechanical devices approved by the Engineer, in accordance with ACI 318. Use the manufacturer's standard jigs, clamps, ignition devices, and other required accessories to support, align, and hold the longitudinal centerline of the bars in a straight line.

3.06 SECURING REINFORCEMENT

A. Securely lace reinforcement with wire to supports or other reinforcing to prevent displacement during concrete placement, as required by the current CRSI (DA4).

3.07 FIELD QUALITY CONTROL

A. Engineer will inspect the reinforcing steel after installation. The Engineer must approve the reinforcing steel placement before concrete placement.

B. Avoid displacing the reinforcing steel during concrete placement.

END OF SECTION

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SCOPE OF WORK

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

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 33 00 - Submittal Procedures

B. Section 03 15 00 - Concrete Accessories

C. Section 03 20 00 - Concrete Reinforcing

D. Section 03 60 00 - Grouting

E. Section 05 12 00 - Structural Steel Framing

F. Section 07 10 00 - Dampproofing and Waterproofing

G. Section 31 23 19 - Dewatering

1.03 REFERENCE STANDARDS

A. ACI 312.3R - Report on Chemical Admixtures for Concrete

B. ACI 301 - Specifications for Concrete Construction

C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete

D. ACI 305R - Guide to Hot Weather Concreting

E. ACI 306R - Guide to Cold Weather Concreting

F. ACI 318: Building Code Requirements for Structural Concrete (ACI 318-19) Commentary on Building Code Requirements for Structural Concrete

G. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field

H. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

I. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

J. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete

K. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete

L. ASTM C150/C150M - Standard Specification for Portland Cement

M. ASTM C172/C172M Standard Practice for Sampling Freshly Mixed Concrete

N. ASTM C183 - Standard Practice for Sampling and the Amount of Testing of Hydraulic Cement

O. ASTM C231 - Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method.

P. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete

Q. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

R. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete

S. ASTM C595/C595M - Standard Specification for Blended Hydraulic Cements

T. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

U. ASTM C989/C989M - Standard Specification for Slag Cement for Use in Concrete and Mortars

V. ASTM D75 / D75M - 19 Standard Practice for Sampling Aggregates

1.04 REFERENCE SPECIFICATIONS

A. The latest or current ACI Standards and Code Requirements for "Concrete and Reinforced Concrete" will govern all concrete Work except where otherwise specified herein.

B. Michigan Department of Transportation, Standard Specifications for Construction, latest edition (MDOT)

1.05 TESTING AGENCY

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

1.06 ALLOWABLE TOLERANCES

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

1.07 DESIGN CRITERIA

A. Design and test mixes for each size and gradation of aggregates and for each consistency intended for use. Design quantities and test results of each mix will be submitted for review and approval by the Engineer.

B. Necessary construction joints are shown on the Plans. Modification of location or placement of construction joints not indicated on the Plans are subject to approval of the Engineer. In general, joints should be located within the middle one-third of the span of slabs, beams, and girders unless a beam intersects a girder at this point, in which case the joint in the girder will be offset a distance equal to twice the width of the beam.

C. Joints in walls and columns will be at the underside of floors, slabs, beams, or girders and at the tops of footings or floor slabs. Place beams, girders, brackets, column capitals, haunches, and drop panels at the same time as slabs. Joints will be perpendicular to the main reinforcement.

D. Expansion joint locations and details will be as shown on the Plans. In no case will any fixed metal be continuous through a expansion joint.

E. Provide keyways in all joints where required to provide for either shear or watertightness. Unless otherwise required, the width of keys will be at least one-third the thickness of the section at that point and their depth at least one-third their width.

1.08 SOURCE QUALITY CONTROL

A. Furnish tests of cement and aggregates. Material sampling will conform to the following:

1. Cement: ASTM C183
2. Aggregates: ASTM D75

B. Conduct tests for the following quantities, or fraction thereof:

1. Cement: 550 tons
2. Fine Aggregate: 2,000 tons
3. Course Aggregate: 2,000 tons

C. Use same brand cement for any given structure produced by a single mill unless otherwise provided by authorization of the Engineer.

1.09 SUBMITTALS

A. Submit shop drawings showing the location of joints, as well as a schedule of the concrete pour(s), for review and approval by the Engineer.

B. Submit concrete mixture designs and test data for review by the Engineer. Concrete will not be placed until the Contractor has received such approval in writing.

C. Each mixture report will include:

1. Slump
2. Total gallons of water per cubic yard
3. Brand, type, composition, and quantity of cement
4. Brand, type, composition, and quantity of pozzolan or other mineral admixtures
5. Brand, type, composition, and quantity of ground granulated blast furnace slag
6. Specific gravity and gradation of each aggregate
7. Ratio of fine to total aggregates
8. Weight (surface dry) of each aggregate in pounds per cubic yard
9. Brand, type, ASTM designation, active chemical ingredients, and quantity of each admixture
10. Air content
11. Compressive strength based on 7-day and 28-day compression tests
12. Time of initial set

D. Submit manufacturer's literature of abrasive wear resistant floor finish and of chemical curing compound for review and approval by the Engineer.

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

F. Submit tickets collected at the site of concrete placement accompanying each load of concrete. A printout system for producing these tickets in connection with automatic batching will be permitted.

1. Each ticket will be serially numbered, show the charging time, quantity and grade of concrete, location of delivery and the signatures of inspectors at the plant and site. Transit mixed concrete tickets will also include revolution counter reading at charging and mixing completion.

G. Submit reports of the sampling and testing of slump, air content and strength performed.

H. Submit reports of nondestructive, core and/or liquid retention testing required for acceptance of concrete in place.

1.10 MATERIAL STORAGE AND HANDLING

A. Store and handle materials sin accordance with ACI 304R and as specified herein.

B. When permission is given to store cement in the open, materials will be placed at least 6 inches above the ground and a waterproof covering will be provided and placed as to ensure runoff in case of rain.

C. Thoroughly shake cement sacks when emptying into the batch. Cement salvaged by the Contractor by cleaning sacks mechanically or otherwise, or from discarded sacks of cement, will not be used in the Work. The use of a fractional sack of cement will not be permitted unless the fractional part is measured by weight. At the time of its use in the Work, the cement must be free from lumps.

D. No aggregates which have become intermixed prior to proportioning will be used. Sufficient aggregate must be available at the site to preclude the possibility of delays while placing the concrete.

E. Cars used for shipping aggregates must be clean and in good repair. The use of straw, marsh, hay or other similar materials for closing cracks or holes in cars will not be tolerated.

F. Store and handle pozzolans and other cementitious materials in the manner of cement.

G. Store and handle curing compound in a manner to prevent contamination.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Environmental requirements will be in accordance with ACI 305R for hot weather concreting, and ACI 306R for cold weather concreting.

B. Specific temperature requirements are contained in Part 2 of this Section for mixing and Part 3 of this Section for placing concrete.

PART 2 PRODUCTS

2.01 MATERIALS - GENERAL

A. Materials will meet the requirements of ACI 301, ACI 318, and MDOT Specification, Division 9.

B. Test and inspect concrete materials will be tested and inspected as the Work progresses. The review and/or check-test of the proposed materials, securing of production samples of materials at plant stockpiles and/or review of the manufacturer's reports for compliance will be incidental to the Contract.

C. Testing and inspection required due to substitution or change of materials requested by the Contractor will be at the Contractor's expense.

2.02 CEMENT

A. Cement will be the type as indicated on the Plans or as specified:

1. Type I and IA, conforming to ASTM C150/C150M, air-entraining Portland cement when special properties are not specified.

2. Type III and IIIA, conforming to ASTM C150/C150M, air-entraining Portland cement for use when high-early strength is specified.

3. Type IS and IS-A, conforming to ASTM C595/C595M, air-entraining Portland blast-furnace slag cement for use in general concrete construction.

4. Type IP and IP-A, conforming to ASTM C595/C595M, air-entraining Portland-Pozzolan cement for use in general construction. The addition of suffix (MS) signifies that moderate sulfate resistance is specified. The addition of suffix (MH) signifies that moderate heat of hydration is specified.

2.03 AGGREGATES

A. Washing will be required to eliminate the dust, clay, or silt coating. Aggregates which have been washed will not be used sooner than 24 hours after washing, unless approved by the Engineer in writing.

B. Coarse aggregate will be gravel or crushed rock, conforming to MDOT Section 902.03. Class17A for members 8 inches or less in thickness and Class 6AA for other construction.

1. Gravel will consist of hard, clean, durable particles of rock or pebbles and will be free from lumps of clay.

2. Crushed rock will consist of angular fragments of crushed hard heads or boulders or crushed igneous rock free from weathered rock and of uniform quality.

3. Sieve and screen analysis determination of clay, silt, and dust content and percentages of objectionable particles will be based on dry weights and conform to MDOT Section 902.03, Table 902-1, "Grading Requirements for Coarse Aggregates, Dense-Graded Aggregates, and Open Graded Aggregates" and Table 902-2, "Physical Requirements for Coarse Aggregate, Dense Graded Aggregates and Open Graded Aggregates".

C. Fine aggregate will be sand size 2NS in accordance with MDOT Section 902.08.

1. Fine aggregates will consist of sharp sand which will be composed of clean, hard, durable grains and will be free from lumps of clay and organic deleterious substances.

2. Fine aggregates will conform to MDOT Section 902.09 and Table 902-4, "Grading Requirements for Fine Aggregates".

2.04 ADMIXTURES

A. Admixtures approved by the Engineer may be used to achieve concrete as indicated on the Plans or specified herein. Calcium chloride will not be allowed.

1. Air-entraining, conforming to ASTM C260/C260M.
2. Pozzolan and fly ash, conforming to ASTM C618, Class F.
3. Water reducing, conforming to ASTM C494/C494M.
4. Retarder, conforming to ASTM C494/C494M.
5. Plasticizer, conforming to ASTM C494/C494M.
6. Ground granulated blast furnace slag conforming to ASTM C989/C989M, Grade 100.

B. Abrasive wear resistant floor finish will be packaged, dry combination of Portland cement, graded quartz aggregate and dispersing agents formulated to produce an abrasive and wear resistant monolithic surface.

2.05 JOINT FILLER

A. See Section 03 15 00 - Concrete Accessories.

2.06 WATER

A. Water will be free from oil, acid, alkali, organic matter, and other deleterious substances. Water approved by the Local Board of Health may be used without testing. Water from other sources must be tested before using.

2.07 CURING COMPOUND

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

2.08 MIXES

A. Concrete will consist of a mixture of air-entraining Portland cement, coarse and fine aggregate, Class F fly ash, and water with admixtures if required.

B. The mixture, combined in proportions, will meet the requirements of MDOT Section 701 and ACI 211.1.

C. Concrete will be classified and proportioned on the basis of minimum compressive strength at 28 days when cured in a moist room at a temperature within the range of 68 - 75 degrees F. The desired strength of the concrete is 3,500 psi unless otherwise shown on the Plans or specified herein.

D. Table 1 shows for each grade of concrete the minimum compressive strength, cement content, and the modulus of rupture.

Table 1 - Concrete Mixtures						
Concrete Grade	**Coarse Agg**	**Type of Cement**	**Cement Content**	**Min Compressive Strength @ 28 days**	**Min Modulus of Rupture @ 28 days**	**% Air**
4500 psi	6AA	I, IA, IS, IS-A	658 lbs/cyd	4500 psi	725 psi	4 - 6
4000 psi	6AA or 17A	I, IA, IS, IS-A	611 lbs/cyd	4000 psi	700 psi	4 - 6
3500 psi	6AA or 17A	IS, IS-A, IP, IP-A	564 lbs/cyd	3500 psi	650 psi	4 - 6

1. Water cement ration will be 0.45, maximum.
2. Structural concrete for walls and slabs will be placed with a slump of 4 inches, maximum.
3. Ground granulated blast furnace slag (GGBFS) may be substituted for cement on a pound for pound basis from a minimum of 25% up to a maximum of 40% GGBFS and 60% cement.
4. Minimum fly ash content in the mix will be 25%, additional fly ash may be substituted for cement on a pound for pound basis up to a maximum of 40% fly ash and 60% cement when approved by the Engineer.
5. Maximum total replacement of cement will not exceed 40%.

E. Proportion aggregates by weight, except for small structures and for incidental Work requiring less than 10 cubic yards of concrete, in which case they may be proportioned by volume when approved by the Engineer.

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

G. When proportioned by volume, the amount of each aggregate required for a single batch will be measured separately and accurately. Shovel methods of measuring will not be permitted. The unit of volumetric measurement will be 1 cubic yard.

H. When proportioned by weight, the amount of each aggregate required for a single batch will be weighed in a separate container. The equipment for weighing will be of an approved type, and of such accuracy that there will not be an error of more than 1% in any single batch.

2.09 BATCHING ADMIXTURES

A. The batching of admixtures to achieve and maintain production of the mix design of concrete will be in accordance with ACI 212.3R.

B. If the air content is found to be less or greater than the specified amount, the Contractor will immediately discontinue Work and correct the air content.

1. Decreasing the air content may be accomplished by blending air-entraining Portland cement with Portland cement, manufactured at the same mill, in a ratio which will reduce the air content to a value within the specified limits, this blending will be reviewed by the Engineer.
2. Increasing the air content may be accomplished by adding to each batch a sufficient amount of air-entraining admixture to bring the air content up to the designed amount.

C. Pozzolan and ground granulated blast furnace slag will be proportioned based on the mix design approved by the Engineer to produce watertight concrete.

D. A water reducer may be used to reduce the water requirement of concrete to obtain consistency of slump, modify workability, increase strength or any other approved use.

2.10 TEMPERATURE LIMITS OF MIXTURE

A. The temperature of the cement, at the time of delivery to the mixer, will not exceed 165 degrees Fahrenheit. The cement will be stored at the Contractor's expense until cooled to that temperature.

B. The temperature limits of aggregates and water entering the mixer will be in accordance with Table 2:

Table 2 - Temperature Limits

Component	Minimum	Maximum
Water	75°F (24°C)	140°F (60°C)
Fine Aggregate	65°F (18°C)	140°F (60°C)
Coarse Aggregate	65°F (18°C)	110°F (43°C)
Concrete (resulting)	60°F (15°C)	90°F (32°C)

2.11 MIXERS AND MIXING

A. Concrete mixing operations will be in accordance with ACI 304 and MDOT Section 701, and will be subject to random inspection during the progress of the Work and will be incidental to the Contract.

B. Central Mixed Concrete:

1. Mixers will be capable of quickly and completely discharging without segregation or loss.
2. Efficiency of the mixers will be maintained at all times through repair or replacement of worn parts when necessary.
3. Mixers will be provided with readily adjustable, automatic devices which will measure the cement and water within 1% and admixtures within 3%.
4. The drum of the mixer will be kept free from hardened concrete and will be completely emptied before recharging.
5. Re-tempering or remixing concrete that has partially set will not be permitted.
6. Mixer will be cleaned thoroughly each time when out of operation for more than 30 minutes.
    a. Recommended mixing time is a minimum time of 1 cubic yard, with an additional 15 seconds for each additional 1 cubic yard.
7. Concrete will be delivered to the site in clean, tight truck bodies designed for this purpose and painted with paraffin if necessary for easy dumping.
8. The concrete at the point of delivery will have the proper consistency and will be free from segregation.

9. Mechanical agitators in the truck bodies will be required if the period of time from the mixing plant to the point of dumping exceeds 30 minutes.

10. No concrete will be dumped if the elapsed time from the mixing plant to the point of dumping exceeds 60 minutes.

C. Transit Mixed Concrete:

1. Transit-mix concrete will be in accordance with ASTM C94/C94M. If transit-mix concrete is used, it will meet all the foregoing requirements specified for central mixed concrete and, in addition, the following:

a. Batched materials will be properly proportioned and in a dry state. The proper amount of water will be added to the mixer on the trucks, and no additional water will be added. No admixtures or accelerators will be added except as herein noted, without the approval of the Engineer.

b. Do not load trucks beyond their rated capacity. Mixing drums must cleaned of all set-up materials at frequent intervals while in use. Trucks with leaking water valves will not be used.

c. Recommended mixing speed should be no less than 12 revolutions per minute, with a minimum of 90 revolutions or until the mix is satisfactory.

d. Continuously mix after adding water to the drum. However, do not place any concrete in the forms more than 90 minutes after you add water to the mix.

e. Deliver truck-mixed concrete to the site of the Work and discharge it from the mixer within the maximum period of 90 minutes from the first introduction of water to the mix. Any concrete which remains in the mixer after this period and any concrete which appears too stiff to be properly workable or which appears to have begun to take its initial set will be rejected and removed from the site of the Work.

D. Owner may employ an independent testing laboratory to provide a qualified inspector to be present at the plant where batching of concrete occurs at the expense of the Owner. The inspector will verify the compliance of the mix with the Contract Documents and will sign a form indicating the quantity of concrete and the concrete mixture of each load.

2.12 CHANGE OF MIXTURE

A. If the Contractor requests a change or substitution of approved batch proportioning, mixing, or delivery operations additional testing and/or inspection will be at Contractor's expense.

2.13 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers of abrasive wear resistant floor finish include:

1. Master Builders Company, "Mastercon Aggregate"

2. Sonneborn Building Products, "Harcol"

3. Approved equal

PART 3 EXECUTION

3.01 VERIFICATION OF FORMWORK, REINFORCING, AND SUBGRADES

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

3.02 EMBEDDED ITEMS

A. Verify the location, from certified vendor or applicable Contract Drawings, of embedded items, including anchor bolts, wall sleeves, wall casting, railing post sleeves and miscellaneous pipes and conduits. Install these items accurately at the determined locations.

3.03 BUILDING IN OTHER WORK

A. Make all necessary provisions in concrete Work for other Work installed by this or other contractors, and build in all required steel beams, frames, curbs, expansion joints, inserts, hangers, pipes, floor drains, pipe trench covers and frames, anchors, sleeves, floor ducts, fiber and steel conduit, pipe hanger sockets, and all other Work furnished by either this or other contractors.

B. Build in all anchors, ties, etc., specified under brick and other Work, in faces of concrete Work which are to be faced with masonry, and any other Work shown or noted to be built into concrete. In addition, Contractor will provide all openings and holes in concrete Work as shown or as needed to accommodate other Work.

3.04 SPECIAL CONCRETE

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

3.05 PREPARATION

A. Notify the Engineer a minimum of 2 working days prior to placement of concrete.

B. Before depositing new concrete on or against existing concrete the existing concrete will be roughened, thoroughly cleaned of foreign matter and laitance, and saturated with water. The cleaned and saturated surface of the hardened concrete, including vertical and inclined surfaces, will be coated with a bonding agent or slushed with a minimum 2 inch thick coating of concrete without coarse aggregate grout against which the new concrete will be placed before the mixture has attained its initial set.

C. Before concrete is placed in any unit, the forms and the placing and fixing of all steel and incidental items must be complete, and the forms, steel and adjacent concrete will be thoroughly cleaned and wetted down.

D. Where indicated on the Plans, the Contractor will bridge the subgrade with at least 2000 psi, 3 inch thick lean concrete before placing the reinforcement an no additional cost to Owner.

E. Do not deposit concrete in any unit until the area has been completely dewatered in accordance with Section 31 23 19, and not until after the Contractor has made satisfactory provisions to eliminate all possibility of water entering or flowing through the concrete while it is being poured or is taking its set. Concrete will not be placed under or on water.

3.06 CONVEYING

A. Concrete handling equipment will be of such a nature and will be so located that the concrete after leaving the mixer will reach its destination with a minimum lapse of time, with no segregation, and loss of slump. The use of drop chutes, except at or in the forms, is prohibited.

B. The interior hopper slope of concrete buckets will be not less than 60 degrees from the horizontal, the minimum dimension of the clear gate opening will be at least 5 times the nominal maximum size aggregate and the area of the gate opening will be not less than 2 square feet.

1. Maximum dimension will not be greater than 2 times the minimum dimension.

2. Bucket gates must be essentially grout tight when closed and may be manually, pneumatically or hydraulically operated except for buckets larger than 2 cubic yards will not be manually operated.

3. Design of the bucket will provide means for positive regulation of the amount and rate of deposit of concrete in each dumping position.

C. Belt conveyors will be designed and operated to assure a uniform flow of concrete from mixer to final place of deposit without segregation of ingredients or loss of mortar and will be provided with positive means for preventing segregation of the concrete at the transfer points and the point of placing.

D. Concrete may be conveyed by positive displacement pump when authorized by the Engineer. The pumping equipment will be piston or squeeze pressure type and constructed of rigid steel pipe or heavy duty flexible rubber hose. The inside diameter of the pipe will be at least 3 times the nominal maximum size coarse aggregate in the concrete mixture to be pumped. The maximum size coarse aggregate will not be reduced to accommodate the pumps.

E. The distance to be pumped must not exceed limits recommended by the pump manufacturer. The concrete will be supplied to the pump continuously. When pumping is completed, concrete remaining in the pipeline will be ejected without contamination of concrete in place. After each operation, equipment must be thoroughly cleaned, and flushing water wasted outside of the forms.

3.07 PLACING

A. Deposit concrete so as to maintain the top surface level, unless otherwise shown on the Plans, and also as to avoid any appreciable flow in the mass.

B. Where placing operations involve dropping the concrete more than 3 feet in the forms, concrete will be deposited through sheet metal or other approved spouts or pipes. These spouts or pipes will have suitable receiving hoppers at the upper ends, and the lower ends will be kept within 6 inch of the newly placed concrete so as to prevent segregation and avoid spattering the reinforcing steel with mortar. Under no circumstances will concrete that has partly hardened be deposited in the Work.

C. Each layer of concrete will be plastic when covered with the following layer and the forms will be filled at a rate of vertical rise of not less than 2 feet per hour. Concrete vibrators will penetrate the initial layer when placing the following layer. Vertical construction joints will be provided as necessary to comply with these requirements.

D. Concrete must be placed and compacted in wall or column forms before any reinforcing steel is placed in the system to be supported by such walls or columns. The portion of any wall or column placed monolithically with a floor or roof slab will not exceed 6 feet of vertical height. Concrete in walls or columns will set at least 2 hours before concrete is placed in the structural systems to be supported by such walls or columns.

E. Concrete must be set when top finished. Laitance, debris, and surplus water will be removed from concrete surfaces at tops of forms by screeding, scraping, or other effective means. Wherever the top of a wall will be exposed to weathering, the forms will be overfilled and after the concrete has settled, the excess will be screeded off.

F. Do not place concrete in contact with frozen ground.

G. Time between charging and placement of concrete must not exceed 90 minutes.

H. Concrete will be compacted by continuous vibrating, tamping, spading or slicing. Care must be taken to eliminate all voids and to provide full bond on reinforcing steel and embedded fixtures. Mechanical vibration will be employed. Concrete will be compacted and thoroughly worked with suitable tools combined with the use of vibrators applied internally and providing a frequency not less than 7,000 revolutions per minute. All such vibrating, including the methods and equipment, will be subject to the review of the Engineer.

I. The time of vibrating in any area will only be sufficient to get efficient compaction, but in no case be carried to the point where there is segregation of the fine and coarse materials of the mix. There will be an absolute minimum of direct vibration of the steel or forms during the process of vibrating. Vibrators will be inserted and withdrawn from the concrete at numerous locations, from 18 - 30 inches apart, but will not be used to transport concrete within the forms. Contractor will have a stand by vibrator on the job site during concrete pouring operations.

3.08 FINISHING UNFORMED SURFACES

A. The unformed surfaces of all concrete will be screeded and given an initial float finish followed by steel troweling.

B. Screeding will provide a concrete surface conforming to the proper elevation and contour with all aggregates completely embedded in mortar. Screeded surfaces must be free of surface irregularities with a height or depth in excess of 1/4 inch as measured from a 10 foot straightedge.

C. Screeded surfaces will be given an initial float finish as soon as the concrete has stiffened sufficiently for proper working. Any piece of coarse aggregate which is disturbed by the float or which causes a surface irregularity will be removed and replaced with mortar. Initial floating will produce a surface of uniform texture and appearance with no unnecessary working of the surface. Floating will be performed with hand floats or suitable mechanical compactor floats.

D. Troweling will be performed after the second floating when the surface has hardened sufficiently to prevent an excess of fines being drawn to the surface. Troweling will produce a dense, smooth, uniform surface free from blemishes and trowel marks. The top surface of driveways, and sidewalks will be given a broomed finish after troweling.

E. Unless specified to be beveled, exposed edges of floated or troweled surfaces will be edged with a tool having 1/4 inch corner radius.

3.09 FINISHING FORMED SURFACES

A. After removal of forms, the finishing of all concrete surfaces will be started as soon as its condition will permit.

B. Grind all seams, fins or projections flush with the concrete surface.

C. Fill and point all honeycomb, tie holes and voids.

D. Dampen the surface with water and apply a cement and silica sand slurry to the entire surface to fill small defects and air voids.

E. Remove excess slurry from concrete. Surfaces to be finished will receive an application of dry Portland cement which will be rubbed into the slightly dampened surface with a suitable cloth.

F. After pointing and removal of projections as specified herein, exposed surfaces of concrete, including walls, columns, beams, pilasters and the undersides of slabs, will be given a rubbed surface finish.

3.10 FLOORS

A. Concrete floor finish will be applied to all building floors not receiving further floor finish. At these locations, the concrete will be brought to the proper elevation and screeded. The surface will be given 2 steel trowelings when the concrete has set sufficiently to finish smoothly. Floors will be sloped uniformly toward floor drains at a slope of 1/8 inch per foot.

B. Concrete finish on steps and loading platforms will be wood troweled to true and uniform surface and then steel troweled. The surface will then be slightly roughened with a broom or by dragging burlap across the surface.

C. Concrete floors will be finished with an abrasive resistant floor finish in the areas noted on the finish schedule on the Plans. Premixed floor hardener will be applied to the surface of the freshly floated concrete floor, in strict accordance with the manufacturer's directions. Color to be selected by the Owner.

3.11 EXPANSION JOINTS

A. Comply with the requirements of Section 03 15 00. Expansion joints will have removable polystyrene joint caps secured to the top thereof and will be accurately positioned and secured against displacement to clean, smooth concrete surfaces.

B. Joint caps will be of the size required to install filler strips at the desired level below the finished concrete surface and to form the groove for the joint sealant to the size shown on the Plans.

C. Do not remove joint caps until after the concrete curing period.

3.12 CONCRETE CURING

A. Cure concrete for a period not less than 7 consecutive days. Contractor must have adequate equipment and curing material on the job site before concrete placement begins to prevent checking and cracking and loss of moisture from all the surfaces of the concrete. Protect concrete from rain, flowing water, wind and the direct rays of the sun. Seal openings in concrete to prevent drying of the concrete during the curing period.

B. Do not use curing compounds on surfaces to which additional concrete or other material are to be bonded.

C. Curing compounds must be applied in strict accordance with the manufacturer's recommendations.

D. Concrete cured with water must be kept wet by covering with ponded water or fog spraying to keep all surfaces continuously wet.

E. Horizontal construction joints and finished surfaces cured with sand will be covered a minimum thickness of 1 inch, uniformly, and kept saturated during the curing period.

F. Burlap used for curing will be treated to resist rot and fire and free of sizing or any substances that are injurious to Portland cement or cause discoloration. Lap strips by half widths. Saturate the burlap with water after placement and during the curing period.

G. Place straw or hay in a layer no less than 6 inch thick and hold it in place using screens, wire or other means to prevent dispersion by the wind. Care must be observed to avoid discoloration of the concrete surface from the vegetable fibers and for the flammability of the material. Saturate the straw or hay with water after placement and during the curing period.

3.13 ENVIRONMENTAL CONDITIONS

A. Provide cold or hot weather protection in accordance with ACI and as specified herein at no additional cost to the Owner.

B. Cold Weather Protection:

1. When placing concrete in cold weather, plan and execute the Work in a manner which will ensure results free from damage through freezing, contraction, and loss of concrete strength.

2. Do not pour concrete when the surrounding temperature is below 40 degrees Fahrenheit, unless the aggregates and water are properly heated. If concrete poured at higher temperatures has not attained a strength equal to 75% of the required strength for its class, house and protect it according to this Section's provisions whenever the surrounding temperature falls below 40 degrees Fahrenheit.

3. Apply heat to the materials in a manner which will keep these materials clean and free from injurious substances.

4. Aggregates may be heated only by steam coils or steam jets, except in the case of small quantities of concrete when other methods may be approved by the Engineer. A sufficient quantity of properly heated aggregates must be on hand prior to starting the pouring of any unit.

5. Properly house concrete with canvas, burlap, or other windproof material in such a manner that any necessary removal of the forms or finishing of the concrete can proceed without undue damage to the concrete from the elements. Heating of the housing must be done in a manner which will maintain a temperature between 50 - 70 degrees Fahrenheit, at all times for at least 5 days after the pour is complete and 12 hours before the pour begins. Exhaust vent supplemental heating units sto the exterior so as to not cause deleterious reactions or deposits to occur to concrete.

C. Hot Weather Protection:

1. Concrete deposited in hot weather must not have a placing temperature that will cause difficulty from loss of slump, flash set, or cold joints. Concrete temperature must be less than 90 degrees Fahrenheit.

2. In hot weather, take suitable precautions to avoid drying of the concrete prior to finishing operations. Use of windbreaks, sunshades, fog sprays, or other devices will be provided by the Contractor at no additional cost to the Owner.

3.14 ADDITION OF WATER

A. To increase workability, adding water to the mix will be limited to a one time addition of 1 gallon per cubic yard and mixed with a minimum of 30 revolutions at a rate of 12 to 15 revolutions per minute. Addition of water will be within the slump requirements.

3.15 CONCRETE DELIVERY TICKET

A. Use a ticket system for recording the transportation of concrete from the batching plant to point of delivery. A ticket will be issued to the truck operator at the point of loading and given to the Engineer upon delivery. At a minimum, each ticket will indicate the time of mixer charging, quantity of concrete, type of mixture including amount of cement, and the plant where the concrete was batched.

3.16 CONCRETE DELIVERY REJECTION

A. Concrete not permitted for inclusion in the Work by the Engineer will be removed from the site. Rejection of concrete will be determined through concrete testing and elapsed time from mixer charging to delivery.

3.17 CONCRETE TESTING AT PLACEMENT

A. Test samples will be made of fresh concrete for each 50 cubic yards, or whenever consistency appears to vary. The cost of sampling and testing of slump, air content and strength will be incidental to the Contract.

B. Secure composite samples in accordance with ASTM C172/C172M.

C. Slump Test:

1. Slump tests will be in accordance with ASTM C143/C143M. Contractor will use the least slump possible consistent with workability for proper placing of the various classifications of concrete.

2. A tolerance of up to 1 inch above the indicated maximum slump will be allowed for individual batches provided the average for all batches or the most recent 10 batches tested, whichever is fewer, does not exceed the maximum limit.

D. Air Content:

1. Air content of normal weight concrete will be determined in accordance with ASTM C231.

E. Compressive Strength:

1. A set of cylinders for compressive strength tests will consist of four cylinders per each set. The temperature of concrete sample will be determined for each strength test.

2. Molding and curing specimens will be in accordance with ASTM C31/C31M. Record any deviations from the requirements of this standard in the test report.

3. Testing specimens will be in accordance with ASTM C39/C39M. Test one specimen 7 days for information and test another sample at 28 days for acceptance.

a. Acceptance test results will be the average of the strengths of the2 specimens tested at 28 days. If one specimen in a test manifests evidence of improper sampling,

molding or testing, it will be discarded and the strength of the remaining cylinder will be considered the test result.

4. The strength level of the concrete will be considered satisfactory so long as the averages of all 28 day strength test results equal or exceed the specified 28-day strength and no individual strength test result falls below the specified 28-day strength by more than 500 psi.

5. If the strength test is not acceptable, further testing must be performed to qualify the concrete. The cost for additional testing will be paid for by the Contractor.

3.18 TESTING OF CONCRETE IN PLACE

A. Testing by impact hammer, sonoscope, or other nondestructive device may be permitted by the Engineer to determine relative strengths at various locations in the structure as an aid in evaluating concrete strength in place or for selecting areas to be cored. Such tests, unless properly calibrated and correlated with other test data, will not be used as a basis for acceptance or rejection.

B. When required by the Engineer, obtain and test cores at least 2 inches in diameter in accordance with ASTM C42.

1. If the concrete in the structure will be dry under service conditions, cores will be air dried (temperature 60° to 80°Fahrenheit, relative humidity less than 60%) for 7 days before the test and the cores will be tested dry.

2. If the concrete in the structure will be more than superficially wet under service conditions, the cores will be tested after moisture conditioning in accordance with ASTM C42.

C. At least 3 representative cores will be taken from each member or area of concrete in place that is considered potentially deficient. The location of cores will be determined by the Engineer so as to least impair the strength of the structure. If, before testing, one or more of the cores shows evidence of having been damaged subsequent to or during removal from the structure, it will be replaced.

D. Concrete in the area represented by a core test will be considered adequate if the average strength of the cores is equal to at least 85% of and if no single core is less than 75% of the specified 28-day strength.

E. Fill core holes using low slump concrete or mortar.

F. Additional testing of materials or concrete occasioned by their failure by test or inspection to meet specification requirements will be paid for by the Contractor.

3.19 RETENTION TESTING

A. Tanks or structures designed to hold or retain water, wastewater or other liquids must be retention tested.

B. To test a tank or structure for leakage, the Contractor will clean, disinfect (if required) and fill the tank or structure with water to its maximum level.

C. The water will be allowed to remain 24 hours with all associated valves and appurtenances tightly closed.

D. During this 24-hour period, the water level (as measured by a hook gauge) will show no measurable loss.

E. If this test fails, the Contractor will dewater the tank or structure, make such repairs as necessary to achieve a watertight tank or structure, clean, disinfect (if required), and retest. This additional testing will be paid for by the Contractor.

F. Tests and repairs will be repeated until the tank or structure is accepted by the Engineer.

3.20 DEFECTIVE CONCRETE

A. If, in the opinion of the Engineer, the defects in the concrete are of such a nature as to warrant condemnation, that portion of the pour may be ordered replaced in its entirety and the Contractor will promptly replace with same without additional compensation.

B. Defective concrete will be repaired by cutting out the defective area and placing new concrete which will be formed with keys, dovetails or anchors to attach it securely in place.

END OF SECTION

SECTION 31 23 13 - SUBGRADE PREPARATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes preparing subgrade for pavement construction complete with excavation, embankments, proof rolling, subgrade undercut and backfill, subgrade stabilization fabric, subbase, right-of-way ditching, right-of-way restoration, field quality control, and appurtenances.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 57 13 - Temporary Erosion and Sediment Control

C. Section 01 89 00 - Site Construction Performance Requirements

D. Section 31 11 00 - Clearing and Grubbing

E. Section 31 22 00 - Grading

F. Section 31 23 19 - Dewatering

G. Section 32 31 00 - Fences and Gates

H. Section 32 92 19 - Seeding

1.03 REFERENCE STANDARDS

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

1. ASTM D1557: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))

2. ASTM D4491/D4491M: Standard Test Methods for Water Permeability of Geotextiles by Permittivity

3. ASTM D4533/D4533M: Standard Test Method for Trapezoid Tearing Strength of Geotextiles

4. ASTM D4751: Standard Test Methods for Determining Apparent Opening Size of a Geotextile

5. ASTM D4632/D4632M: Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

6. ASTM D6241: Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile- Related Products Using a 50-mm Probe

7. American Association of State Highways and Transportation Officials

8. Michigan Department of Transportation (MDOT), Standard Specifications for Construction, latest edition.

1.04 ALLOWABLE TOLERANCES

A. Shape the finished subgrade surface to conform to plan grade and cross section within a tolerance of 1 inch in 10 feet.

1.05 SUBMITTALS

A. Test Reports:

1. Testing lab must provide the Engineer with two (2) certified copies of the sieve analysis of the backfill material.

2. Perform testing of the material and certify the test results through a testing laboratory approved by the Engineer.

3. Testing lab must provide the Engineer with two (2) certified copies of the compaction and moisture tests of the backfill and subgrade materials.

4. Use a testing laboratory approved by the Engineer to perform testing of the materials and certify the test results.

B. Samples:

1. Submit sample of the proposed subgrade stabilization fabric measuring not less than 1 syd in area, and the manufacturer's certification that the proposed fabric meets or exceeds the requirements listed in Part 2 of this Section.

2. Make submissions no later than 10 working days before any installation.

1.06 PRODUCT DELIVERY STORAGE AND HANDLING

A. Furnish and store geotextile fabric in a wrap that protects it from ultraviolet radiation and abrasion. Cover the geotextile with the aggregate base as per plan within two (2) weeks of placement.

1.07 SOIL EROSION AND SEDIMENTATION CONTROL

A. Provide, maintain, and remove temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or as determined by the Engineer.

B. Implement measures to prevent surface runoff from carrying excavated materials into the drain, reduce erosion of the slopes, and prevent silting in of the drain downstream of the Work.

C. Measures should include provisions to reduce erosions by the wind of areas stripped of vegetation, including material stockpiles.

D. Comply with requirements of Section 01 57 13.

PART 2 PRODUCTS

2.01 GRANULAR MATERIALS

A. Ensure Granular Material conforms to the requirements for Class II granular material as specified in MDOT Section 902.

2.02 AGGREGATE MATERIALS

A. Use crushed limestone, natural aggregate, blast furnace slag, or crushed concrete for undercut backfill, meeting the requirements of 21AA, 21A, or 22A as specified in MDOT Section 902. Ensure crushed concrete is free of all steel and other deleterious materials.

2.03 SUBGRADE STABILIZATION FABRIC

A. Compose subgrade stabilization fabric of synthetic fibers formed into a woven fabric. Use fibers made of 85% propylene or ester polymers. Ensure the geotextile conforms to the following requirements listed below:

Property	Test Procedure	Test Result
Grab Tensile	ASTM D4632/D4632M	270 lbs. (min)
Elongation	ASTM D4632/D4632M	15% (min)
Trapezoidal Tear	ASTM D4533/D4533M	100 lbs. (min)
CBR Puncture Strength	ASTM D6241	900 lbs. (min)
Apparent Opening Size	ASTM D4751	40 – 70 U.S. Sieve
Permittivity	ASTM D4491/D4491M	0.05 per sec (min)

2.04 SEPARATOR FABRIC

A. Furnish geotextiles of either woven or nonwoven polyester, polypropylene, stabilized nylon, polyethylene, or polyvinylidene chloride. Geotextile must have the minimum required strength values in the weakest primary direction. Contractor may use nonwoven geotextile that is one or a combination of the following:

1. Needle punched, heat bonded, or resin bonded

B. Furnish a manufacturer's certified report of test or analysis that shows the geotextile delivered meets the requirements of this specification to the Engineer at least 15 days before use in the Work. Mark the delivered geotextile to clearly identify it with the applicable test report furnished to the Engineer.

C. If using sewn seams, furnish a field sewn seam sample produced from the geotextile and thread sewn with the equipment that will be used on the project, before incorporating into the work.

D. Furnish geotextile conforming to the following physical properties:

Test	Method	Value
Minimum grab tensile strength	ASTM D4632/D4632M	170 lb
Minimum puncture strength	ASTM D6241	350 lb
Maximum apparent opening size	ASTM D4751	No. 70 sieve
Minimum permittivity	ASTM D4491/D4491M	0.35 s-1

1. Numerical values represent minimum/maximum average roll values. Average test results from all rolls in a lot must conform to the tabulated values.

PART 3 EXECUTION

3.01 REMOVING STRUCTURES

A. Remove structures and sewers as called for on the Plans or as determined by the Engineer. Perform removal or abandonment of structures in accordance with Section 01 89 00.

3.02 HOLES

A. Replace earth removed during any phase of excavation or removal operations that results in a hole or void by backfilling to the proposed subgrade with suitable Granular Material approved by the Engineer.

B. Compact material to 95% of its maximum unit weight.

C. Furnish, place, and compact the backfill material at the Contractor's expense.

3.03 SALVAGING AND STOCKPILING TOPSOIL

A. Remove topsoil, within the grading limits for cuts and where the fill is less than 5 feet in height to the top of the proposed road, to the depth and width specified on the Plans.

B. Do not remove topsoil from peat and muck areas.

C. Topsoil salvaged in excess of that required by the Plans will be disposed of by the Contractor at Contractor's expense.

D. Remove and salvage topsoil in accordance with Section 31 22 00.

3.04 PREPARING ROADWAY SUBGRADE

A. Remove, displace, or otherwise treat muck, peat, and other unsuitable material within the roadway as shown on the Plans or as directed by the Engineer.

B. Remove deposits of frost heave material within lines 2 feet outside the proposed roadbed to a depth of 3 feet below the surface of the earth grade, unless otherwise shown on the Plans or as determined by the Engineer.

C. Remove ice and snow from the surface of the ground before placing the embankment.

D. Dispose of muck, peat, frost heave material, and other unsuitable material outside the highway limits or spread them uniformly in low places beyond the roadway limits when approved by the Engineer.

E. Plow or scarify old road surfacing, gravel, crushed stone, or other nonrigid type surfacing occurring within the roadbed area and underlying proposed embankment less than 1 foot in depth, that is not salvaged or incorporated in the new Work, full depth. Spread and compact it to form a uniform foundation before placing any new embankment.

F. Break up, remove, and dispose of old pavement and other rigid structures occurring within the roadbed area and underlying the proposed embankment less than 1 foot in depth that are not incorporated into the new Work.

3.05 SUBGRADE

A. Excavate and smooth the area to be paved to the line, grade, and cross section indicated on the Plans.

B. Compact the subgrade between the lines 2 feet on either side of the proposed edge of pavement or curb to 95% of the maximum unit weight for a depth of 7 inches by rolling with a roller weighing not less than 10 tons.

C. Complete subgrade ahead of placing forms or paving a distance equal to one day's average paving operation. Shape and compact the subgrade to the Plan cross section by approved mechanical means before the paving operation.

3.06 PAVEMENT EXCAVATION

A. Perform pavement excavation to construct the earth grade and its appurtenances true to the lines, grades, and cross sections called for on the Plans and in accordance with these Specifications.

B. Include the following items in excavation, any or all of which may be included or incidental: remove trees, stumps, hedges, roots, culverts, sewers, miscellaneous structures; perform roadway excavation; remove asphalt or concrete pavements, curbs, curb and gutters, sidewalks, end headers; remove aggregate surfaces; salvage and stockpile topsoil; perform subgrade undercut; excavate for structures; trim and finish earth grade; perform fine grading, right-of-way ditching and restoration; and dispose of unsuitable material.

C. Completely remove large stones, trees, stumps, brush, shrubs, logs, matted roots, other vegetation, and debris occurring between lines 3 feet outside the grading limits or as otherwise shown on the Plans. Properly dispose of them as specified in Section 31 11 00.

D. Excavate earth and other existing materials to the full depth and width of the cross section shown on the Plans. Excavate material sufficiently to set forms or slip-form equipment. Limit excavation to 3,000 linear feet of right-of-way unless additional lengths are requested in writing and approved by the Engineer.

E. Remove excess excavated material from the project by the Contractor along approved routes to disposal sites approved by the Owner. Consider disposal of excess excavation and maintenance of the dump sites incidental to the price paid for excavation and perform as specified in Section 01 89 00.

3.07 BORROW EXCAVATION

A. Consider materials secured from locations outside the project limits for completing embankments and other items as borrow excavation. Subject borrow pits and materials to removal to inspection by the Engineer. Secure borrow pits and materials by the Contractor unless otherwise provided.

B. Measure borrow excavation by volume in cubic yards compacted in place, based on the neat lines called for on the Plans or authorized by the Engineer. Perform all regular excavation and grading with existing materials for any designated area to facilitate accurate measurement of borrow quantities, unless otherwise specified in the Contract Documents. Have the Engineer cross section these areas prior to furnishing and placing the required borrow material. Have the Engineer resection the completed area and compute the volume of borrow material in its compacted-in-place state. Do not measure or compute borrow material placed beyond the neat lines called for on the Plans or not authorized by the Engineer in writing as borrow excavation. Reject measurement of borrow material by truck count.

C. Maintain public and private roads used between the source of borrow and the Project at the Contractor's expense, including repairs of any damage caused by Contractor's operations. Apply a dust palliative when necessary, as determined by the Engineer.

3.08 EMBANKMENTS

A. Construct embankments with sound earth. Deposit and compact the materials by either the Twelve Inch Layer Method or the Controlled Density Method. Use the Controlled Density Method unless the Twelve Inch Layer Method or another method is specifically called for on the Plans.

B. Strip topsoil from the entire fill area. Remove topsoil to the depth shown on the Plans or determined by the Engineer. After removing topsoil, compact the entire area for embankment construction to not less than 90% of the maximum unit weight, to a depth of 9 inches.

C. Carefully place material where stones are prevalent so that all large stones distribute well and crevices fill completely with smaller stones, earth, sand, or gravel to form a solid embankment. Do not place rock or fragmental material of a size that prohibits placement in layers of the specified depth in the embankment. Do not place stones over 3 inches in diameter within 12 inches of the surface of the earth grade within the areas between lines 2 feet outside the edges of the proposed roadbed.

D. Do not place frozen material in the embankment, nor place the embankment upon frozen material.

E. Construction requirements for the two (2) methods of placing and compacting embankments are as follows:

    1. Twelve-Inch Layer Method:

        a. Deposit and spread the material in layers not more than 12 inches deep, loose measure, parallel to the finished grade and extending to the full width of the embankment. Deposit the material by operating the conveying equipment over the layer being placed, as far as feasible.

        b. Compact each layer to not less than 95% of the maximum unit weight at the existing moisture content. Continue compacting until each layer reaches the required density across its full width.

    2. Controlled Density Method:

        a. Deposit and spread embankment material in layers not more than 9 inches deep, loose measure, extending to the full width of the embankment. Spread and compact granular material in layers not more than 15 inches thick if the specified density is obtained.

        b. Use material for embankments of 5 feet or less and the bottom 4 feet of embankments of more than four 4 feet above the ground surface with no more than the optimum moisture content at compaction time.

        c. Use material for the embankment more than 5 feet above the ground surface with a moisture content not greater than 3% above optimum at compaction time, except keep the moisture content of the top 3 feet of the embankment at or below optimum.

F. If granular material is used to construct the embankment, ensure the moisture content is below saturation.

G. If the material contains an excess of moisture, ensure it is dried to the required moisture content before being compacted.

H. Compact each layer of material containing the required moisture to not less than 95% of its maximum unit weight, unless otherwise specified, before starting the succeeding layer.

I. Change the method of operation when the original ground, any section of compacted embankment, or the soil in cut sections becomes rutted or distorted by the Contractor's equipment. Reshape and recompact all rutted or distorted areas at the Contractor's expense before placing any succeeding layers.

3.09 ROUGH GRADING

A. Contractor shall rough grade as close as possible to finished subgrade leaving a minimum to be removed in fine grading.

B. Remove any excavated material stored along the line of Work between curb and sidewalk on improved lawns within 48 hours. Leave lawns or other improved areas in a neat and clean state within the specified 48 hours.

C. Keep the Work area free of water during the excavation operation, including placement of the subbase. Provide and maintain a dewatering system at the Contractor's expense. Keep the dewatering system in operation until paving is completed.

3.10 PROOF ROLLING

A. After removal of topsoil or other overburden and after construction of embankments, proof roll the existing subgrade with six passes of a minimum 15 ton pneumatic-tired roller. Operate the roller in a systematic manner to assure the number of passes over all areas, and at speeds between 2.5 and 3.5 miles per hour.

B. Make one-half of the proof rolling passes under structures in a direction perpendicular to the other passes.

C. Perform proof rolling in the presence of the Engineer. Undercut material showing rutting or pumping, as determined by the Engineer, and replace it with the appropriate fill material.

D. Perform proof rolling only when weather conditions permit. Do not proof roll wet or saturated subgrades.Replace materials degraded by proof rolling a wet or saturated subgrade, as determined by the Engineer, at no cost to the Owner. Notify the Engineer 3 days prior to proof rolling.

3.11 SUBGRADE UNDERCUT EXCAVATION

A. Unsuitable subgrade excavation must be the operation of:

1. removing unsuitable soils as determined by the Engineer, below the level of the ground after topsoil has been stripped in fill areas where the embankment is to be 5 feet or less in height to plan grade, or;

2. the removal of unsuitable soils below the subgrade elevation, as determined by the Engineer in cut areas after the subgrade has been established.

B. In fill areas, after topsoil has been stripped in accordance with this Section, the Engineer will inspect the embankment area to certify the adequacy of the native soils and to determine the extent of any additional excavation of unsuitable soils prior to placing the first lift of the embankment.

C. In cut areas after the subgrade elevation has been established by the mass grading operation, the Engineer will inspect the subgrade to determine the extent of any additional excavation of unsuitable soils.

D. Backfill areas excavated of unsuitable material with non-frost heaving material similar to adjacent soil, unless otherwise specified in the Contract Documents. Backfill excavation with MDOT Granular Material, Class II, and provide drainage in areas with free water due to seepage as determined by the Engineer. Compact backfill to not less than 95% of the maximum unit weight, unless otherwise specified.

3.12 SUBGRADE STABILIZATION FABRIC

A. Place Subgrade Stabilization Fabric on prepared subgrade or subbase in the manner and at the location as called for on the plans. Lay the fabric smooth and free of tension stress, wrinkles, or creases.

B. Place fabric strips to provide a minimum overlap of 24 inches for each joint. Position fabric so the upper strip overlaps the next lower strip.

C. If the geotextile sustains damage during construction, repair the torn or punctured section by placing a fabric piece large enough to cover the damaged area plus 24 inches beyond to adjacent undamaged geotextile in all directions.

3.13 GEOTEXTILE SEPARATOR FABRIC

A. Before placing the geotextile, smooth, shape, and compact the subgrade to the required grade, section, and density. After placing the geotextile on the subgrade, do not allow traffic or construction equipment to travel directly on the geotextile.

B. Roll the geotextile out on the roadway and pull taut manually to remove wrinkles. Join separate pieces of geotextile by overlapping or sewing. Place the geotextile in the overlapped joints so it overlaps at least 18 inches.

C. Engineer may require the use of weights or pins to prevent the wind from lifting the geotextile.

D. After placing, do not expose the geotextile longer than 48 hours before covering.

E. Place backfill material over the geotextile by back dumping with trucks and leveling with a crawler dozer. Do not use construction equipment that causes ruts deeper than 3 inches. Fill ruts with additional material. Do not smooth ruts without adding additional material. Cover damaged areas with a patch of geotextile using a 3 foot overlap in all directions.

3.14 TRIMMING AND FINISHING EARTH GRADE

A. After constructing the earth grade to the required grade, remove all stones and rocks more than 3 inches in diameter appearing on the subgrade surface.

B. Trim earth grade and subgrade to the grade called for on the Plans. Trim subgrade requiring a subbase or base course to the established grade within ± 0.1 foot. Trim subgrade without a subbase or base course to the established grade within ± 3/4 inch.

C. Trim the earth grade outside the subgrade, smooth all irregularities, and complete the entire site or roadway to the required lines, grades, and cross sections. Finish backslopes and fill slopes as either Class A or Class B slopes. Require Class A slopes unless otherwise specified in the Contract Documents.

1. Class A Slopes:

    a. Finish Class A slopes to the average slopes shown on the Plans, allowing no variations exceeding 0.1 foot above or below the established grade measured at right angles to the slopes.

2. Class B Slopes:

    a. Finish Class B backslopes to the average slopes shown on the Plans, allowing no variations exceeding 0.5 foot above or below the established grade measured at right angles to the slope.

    b. Finish Class B fill slopes to within 0.2 foot of the established grade and cross section from the outside shoulder line for a distance of 3 feet down the slope. Ensure the remainder of the completed fill slope conforms to the requirements for Class B backslopes.

3. Obtain the degree of finish of the slopes from machine operations. Do not require the smoothness of surface finish ordinarily associated with template, string line, or hand operations, but do not permit abrupt variations.

4. Remove debris except sod, leaf mold, and rotted forest litter. Break or remove loose clods of earth extending beyond the specified slope tolerance.

5. Where waste earth or other surplus material is deposited on fill slopes, the slopes may be flattened or otherwise altered as directed by the Engineer, to produce a uniform cross section which blends with the topography and presents a pleasing appearance.

D. Round the tops of backslopes, bottoms of fill slopes, and all other angles in the cross section lines to form vertical curves as shown on the Plans or as determined by the Engineer, where trees or other restrictions do not interfere. Make transitions in length of vertical curves gradual to present a uniform and attractive appearance. Omit vertical curves when constructing ditches in peat.

3.15 SUBBASE

A. Spread and compact Granular material for subbase evenly as specified in MDOT Section 301.

B. Determine the thickness of each layer placed by the required density obtained, but do not exceed 15 inches in depth, loose measure.

C. Construct the subbase to the alignment, grade, and cross section shown on the Plans. Cease operation immediately if the subgrade becomes soft or unstable causing rutting, or if subgrade material forces up into the subbase during placing. Remove and dispose of the mixed material. Correct the subgrade and place and compact new subbase material. Consider this Work incidental to the construction of the Project.

3.16 SCARIFY, RE-GRADE AND COMPACT EXISTING SUBGRADE

A. Scarify the existing subgrade (base) to a depth of 9 inches within the limits as shown on the plans. Reshape the subgrade to the cross section shown on the plans and compact it to 95% of its maximum unit weight by rolling with a roller weighing not less than 10 tons.

3.17 ROADWAY DITCHING

A. Construct ditching at the locations called for on the Plans or as determined by the Engineer. Shape the ditch by machine grading or another method approved by the Engineer to achieve the cross section, line, and grade shown on the Plans.

B. Dispose of the excess material from ditch construction by the Contractor at Contractor's expense.

C. Grade the ditch section to receive topsoil and seed.

1. Conform topsoil, seed, fertilizer, and mulch to the requirements specified on the Plans and in Section 32 92 19.

D. Furnish, place, and compact any additional material needed to construct the ditch at the location and cross sections called for on the Plans, at Contractor's expense.

3.18 RIGHT-OF-WAY RESTORATION

A. Restore the right-of-way in accordance with the type and location specified on the Plans. Shape the right-of-way by machine grading or another method approved by the Engineer to achieve the cross section, line, and grade shown on the Plans.

B. Dispose of excess material from the right-of-way restoration operation by the Contractor at Contractor's expense, as specified in Section 01 89 00.

C. Grade the right-of-way to receive topsoil and seed.

1. Conform topsoil, seed, fertilizer, and mulch to the requirements specified on the Plans and in Section 32 92 19.

D. Furnish, place, and compact any additional fill meeting the Engineer's approval, needed to construct the right-of-way to the cross sections called for on the Plans, at Contractor's expense.

3.19 MACHINE GRADING

A. Perform machine grading consisting of light grading that generally utilizes excavation from ditches and roadbed to shape shoulders and adjacent shallow fills. Use a blade grader or similar equipment. Apply machine grading on the sections shown on the Plans or specified in the Contract Documents.

B. Include all necessary scarifying, plowing, discing, moving, and shaping of the earth to develop the cross section shown on the Plans.

C. Make ditches conform reasonably close to the line and grade shown on the Plans or as directed, and drain runoff waters to outlets shown on the Plans or designated by the Engineer.

D. Finish the roadbed to grade using a blade grader or equivalent equipment.

E. Grade intersections, approaches, entrances, and driveways as shown or directed, excluding loading and hauling of earth as part of this Work.

3.20 MAINTENANCE AGGREGATE

A. Furnish and install MDOT 21A, 21AA or 22A maintenance aggregate to maintain pedestrian and traffic access. Place and compact aggregate to maintain access in areas determined by the Engineer.

B. Maintenance aggregate will be incidental to the Project unless otherwise specified in the Contract Documents.

3.21 TESTING

A. During the course of the Work, the Engineer may require testing for compaction, sieve analysis and moisture content of the backfill and subgrade materials.

B. Have a testing laboratory suitable to the Owner and approved by the Engineer perform sampling and required testing.

C. Engineer must determine the location and number of samples to be made. ve the testing laboratory furnish the Engineer with two (2) certified copies of the results of all tests.

D. Conform testing procedures to current MDOT Standards for Construction .

E. Understand maximum unit weight, when measuring soil compaction or density, as the maximum unit weight per cubic foot (or cubic meter) determined by ASTM D1557, Method D, modified to include all the material passing the 1 inch sieve.

3.22 DEFECTIVE WORK

A. Correct any portion of the backfill, subbase, or subgrade deficient in specified density by methods approved by the Engineer.

B. Charge any extra testing or sampling required by the Engineer due to deficiencies to the Contractor's expense.

END OF SECTION

SECTION 31 23 16 - STRUCTURAL EXCAVATION AND BACKFILL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes excavation for structures, removal and disposal of excavated materials, backfilling, backfill materials and compaction.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 57 13 - Temporary Erosion and Sediment Control

B. Section 01 89 00 - Site Construction Performance Requirements

C. Section 31 11 00 - Clearing and Grubbing

D. Section 31 22 00 - Grading

E. Section 31 23 19 - Dewatering

F. Section 32 92 19 - Seeding

1.03 REFERENCE STANDARDS

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

1. ASTM D1557: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3)

2. American Association of State Highway Transportation Officials

3. Michigan Department of Transportation (MDOT), Standard Specifications for Construction, latest edition

1.04 SUBMITTALS

A. Have the testing laboratory provide the Engineer with two (2) certified copies of the backfill compaction test results. Perform compaction testing and certification by a testing laboratory approved by the Engineer.

1.05 SOIL EROSION AND SEDIMENTATION CONTROL

A. Provide, maintain, and remove temporary and/or permanent soil erosion and sedimentation control measures as specified on the Plans or determined by the Engineer.

B. Prevent surface runoff from carrying excavated materials into waterways, reduce erosion of slopes, and prevent silting of waterways downstream of the Work.

C. Measures should include provisions to reduce erosion by the wind of areas stripped of vegetation, including material stockpiles.

D. Comply with requirements of Section 01 57 13.

PART 2 PRODUCTS

2.01 GRANULAR MATERIALS

A. Make granular material conform to the requirements for Class II, as specified in MDOT Section 902. Use natural bank run sand for granular material.

2.02 COARSE AGGREGATE

A. Make coarse aggregate conform to the requirements for 6A, as specified in MDOT Section 902.

PART 3 EXECUTION

3.01 DEWATERING

A. Dewater the area within the vicinity of the new Work in accordance with Section 31 23 19 prior to the excavation operation.

B. Ensure the depth of dewatering allows the excavation to remain dry during the construction of the structure, including excavating, backfilling, and compacting operations.

3.02 SHEETING, SHORING, AND BRACING

A. Furnish, place, and maintain sheeting, shoring, and bracing of the excavated area at all times to ensure the safety of workmen and protect the new Work or adjacent structures, including pavement, curbs, sidewalks, pipelines, and conduits next to or crossing the excavated area, as well as the safety of pedestrian and vehicular traffic.

B. Take responsibility for the complete design of all sheeting, shoring, and bracing Work. Design the system to suit soil conditions, with sufficient strength, quality, dimension, and spacing to prevent caving, loss of ground, or squeezing within the neat lines of the excavation, and to effectively restrain movement of adjacent soil.

C. Submit Plans for sheeting, shoring, or bracing Work to the Engineer for informational purposes only before installation.

D. Make sheeting, shoring, bracing, and excavation conform to current federal or state safety regulations.

E. Install and leave sheeting, shoring, and bracing in place where indicated on the Plans and necessary in the Work. No extra compensation will be paid to the Contractor for sheeting, shoring or bracing left in place unless otherwise indicated in the Proposal.

F. Make supports for pipes, conduits, etc., crossing the excavated area conform to the requirements of the owners of such facilities, and leave them in place if necessary.

G. Provide, place, maintain, and remove sheeting, shoring, and bracing materials at the Contractor's expense unless otherwise indicated in the Proposal.

H. Do not remove sheeting, shoring, or bracing until the structure attains sufficient strength to support external loads.

I. Prevent sheeting, shoring, and bracing material from contacting the structure, and install them to avoid transmitting concentrated loads or horizontal thrusts to the structure.

3.03 COFFERDAMS

A. Maintain, install, and remove a cofferdam as a substantially watertight enclosure, well-point system, or similar system that permits construction of the substructure above seal or subfooting in dry conditions and without damaging the Work.

B. Alternate methods, where used in lieu of cofferdams, will be permitted by authorization only. Such authorization will be considered only after receipt of a permit from all federal, local or State agencies with jurisdiction for the alternate method.

C. Stream diversion and earth dikes, where used in lieu of cofferdams or a well-point system will be permitted by authorization only. Such authorization will be considered only after receipt of a permit from all federal, local or State agencies with jurisdiction for such construction.

D. Make interior dimensions of cofferdams sufficient to provide clearance for constructing forms, inspecting their exteriors, and permitting dewatering outside the forms.

E. Right or enlarge cofferdams, caissons, or cribs tilted or moved laterally during sinking to provide necessary clearance.

F. Do not brace cofferdams to substructure forms. Construct cofferdams to protect the Work in place from damage by high water and prevent foundation injury by erosion.

G. Prevent timber bracing from extending into or remaining in the finished concrete.

H. Remove cofferdams without disturbing or marring the finished concrete. Leave cofferdam sheeting in place when called for on the Plans or when necessary in the Work.

I. Provide, construct, maintain, and remove cofferdams, including pumping, at the Contractor 's expense.

J. Take responsibility for any claims for damages resulting from electing to use a well-point system or similar system.

3.04 EXCAVATION

A. Include site clearing and grubbing, excavating and disposing of all encountered materials, supporting and protecting all structures and/or utilities above and below the ground surface, and removing water from the construction site in excavation.

B. Include removal of existing structures, as shown on the Plans or determined by the Engineer, in excavation.

C. Perform rock excavation, if applicable, as part of the excavation according to specifications contained elsewhere.

D. Keep excavation operations within reasonable close conformity with the location and grade of each structure.

E. Temporarily store excavated materials to avoid damage to trees, shrubs, fences, improvements, utilities, private property, or traffic. Do not place excavated materials in locations that endanger excavation banks by imposing loads.

F. Make the excavation large enough to allow construction of the new Work, placement and compaction of backfill, and dewatering operations.

G. Take special care not to disturb excavated surfaces, other than rock, where concrete will bear. Perform final removal of foundation material to grade just before placing the concrete.

H. Do not place concrete until checking the excavation depth and reviewing the suitability of foundation material with the Engineer.

I. Excavated material, determined by the Engineer as suitable for backfill may be used.

J. Dispose of excess materials at the Contractor's expense, as specified in Section 01 89 00.

K. Make changes to footing bottom elevations as necessary to ensure a satisfactory foundation. Review any required changes with the Engineer before proceeding.

L. Clean all rock or hard material surfaces of loose fragments and cut them to a firm surface before placing concrete. Make the surface level, stepped, or serrated, as shown on the Plans.

M. Remove unsound material underlying proposed structures and replace it with granular material approved by the Engineer, in layers not exceeding 6 inches in depth. Compact each layer to 95% of maximum unit weight unless indicated otherwise on the Plans, or within these specifications.

3.05 BACKFILL

A. Place backfill material only after the Engineer inspects the new Work and backfill material.

B. Do not place backfill against any portion of the new Work until completing required curing, surface finishing, and waterproofing. Avoid placing backfill that creates unequalized horizontal loading until the concrete reaches at least 70% of its design strength. Place required backfill on opposite sides at the same time to equalize horizontal loadings.

C. Use granular material for backfilling within 3 feet of all manholes, chambers, valve wells, valve boxes, other pipeline structures, footings, piers, abutments, columns, walls, foundations, etc., unless otherwise indicated in the Contract Documents.

D. Backfill spaces excavated and not occupied by the new Work or specified backfill material with suitable material from the excavation.

E. After placing and compacting backfill to the flow line elevation of any weep holes indicated on the Plans, cover the back end of each weep hole with no less than 2 cubic feet of coarse aggregate.

F. Exclude large stones, boulders, broken rocks, concrete, and masonry from backfill.

G. Carry backfill up to the surface of adjacent ground or to the elevation of proposed earth grade, and neatly grade its top surface. Trim fills around all new Work to the lines shown on the Plans or as directed by the Engineer.

3.06 COMPACTING BACKFILL

A. Place all backfill behind and around the new Work in layers not exceeding 9 inches in depth, and compact to at least 95% of maximum unit weight.

B. Compact areas where density does not affect construction, as determined by the Engineer, to at least 90% of maximum unit weight.

C. Place backfill material as specified in MDOT Section 206.03.B, except for the following modifications. Ensure moisture content does not exceed 3% above optimum at the time of compaction. Dry material to required moisture content before installation if it contains excess moisture.

D. Compact each layer containing the required moisture to at least 95% of maximum unit weight before starting the succeeding layer, unless otherwise specified on the Plans or authorized by the Engineer.

E. Consider compaction of backfill incidental to the Work of backfilling, including all soil manipulation to achieve specified densities, with no separate payment. No additional compensation will be allowed for any delay required to obtain the specified moisture content or the specified density.

3.07 CLEANUP

A. Remove and dispose of excess material immediately after placing and compacting backfill at the Contractor's expense, as specified in Section 01 89 00.

B. Grade the construction area and leave it in a neat, workmanlike condition.

C. At a seasonally correct time, rake the disturbed area, place topsoil, fertilize, and restore according to the requirements of Section 32 9219.

3.08 TESTING

A. During the Work, perform testing for backfill compaction or density as required by the Engineer. Have a testing laboratory approved by the Engineer take samples and conduct the testing.

1. Charge the cost for testing and sampling to the Owner.

B. Have the testing laboratory furnish the Engineer with two (2) certified copies of all test results. Conform testing procedures to current MDOT's Standard Specifications for Construction.

C. Understand the maximum unit weight, when measuring soil compaction or density, as the maximum unit weight per cubic foot or cubic meter determined by ASTM D1557, Method A, for Granular Materials, and Method C for all other soils.

3.09 DEFECTIVE WORK

A. Correct any portion of the backfill deficient in specified density by methods approved by the Engineer. Charge any extra testing or sampling required due to apparent deficiencies to the Contractor's expense.

END OF SECTION

SECTION 31 23 33 - TRENCHING AND BACKFILLING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes open trench construction for utility installation, complete with trenching, sheeting, bracing, bedding, bedding materials, backfilling, backfill materials, and compaction.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 57 13 - Temporary Erosion and Sediment Control

B. Section 01 89 00 - Site Construction Performance Requirements

C. Section 31 11 00 - Clearing and Grubbing

D. Section 31 22 00 - Grading

E. Section 31 23 16 - Structural Excavation and Backfill

F. Section 31 23 19 - Dewatering

G. Section 32 92 19 - Seeding

H. Section 32 92 23 - Sodding

I. Section 33 14 00 - Water Utility Distribution Piping

J. Section 33 30 00 - Sanitary Utility Sewerage Piping

K. Section 33 31 00 - Sanitary Sewerage Piping

L. Section 33 41 00 - Storm Utility Drainage Piping

1.03 REFERENCE STANDARDS

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

1. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete
2. ASTM C150/C150M - Standard Specification for Portland Cement
3. ASTM C595/C595M - Standard Specification for Blended Hydraulic Cements
4. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
5. ASTM C1479/C1479M - Standard Practice for Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations
6. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))
7. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
8. American Association of State Highway Transportation Officials

9. Michigan Department of Transportation (MDOT), Standard Specifications for Construction, latest edition

1.04 TEST REPORTS

A. Testing laboratory must provide the Engineer with two (2) certified copies of the test results of the compaction of the backfill.

B. Perform testing for compaction and certify the test results through a testing laboratory approved by the Engineer.

1.05 MIX DESIGN

A. Submit mix designs for any concrete or flowable fill mixtures to be used on the Project. Include certified test results for seven day and 28 day strengths, together with any technical information for admixtures.

1.06 SOIL EROSION AND SEDIMENTATION CONTROL

A. Provide, maintain, and remove temporary and/or permanent soil erosion and sedimentation control measures at Contractor's expense, as specified on the Plans or as determined by the Engineer.

B. Prevent surface runoff from carrying excavated materials into the drain, reduce erosion of the slopes, and prevent silting in of the drain downstream of the Work.

C. Measures should include provisions to reduce erosions by the wind of all areas stripped of vegetation, including material stockpiles.

D. Comply with requirements of Section 01 57 13.

PART 2 PRODUCTS

2.01 GRANULAR MATERIALS CLASS II

A. Conform to the requirements for Granular Material Class II as specified in MDOT Section 902, except the granular material must be natural bank run sand with a maximum size of 1-1/2 inches.

2.02 CRUSHED STONE BEDDING

A. Crushed, angular, natural stone material, meeting the requirements of 21AA coarse aggregate as specified in MDOT Section 902. Crushed concrete and slag are not allowed.

2.03 CONCRETE

A. Conform to MDOT Section 1004 ; use 3,000 psi strength; Type IA cement; MDOT 6A coarse aggregate; MDOT 2NS fine aggregate; 3 inch maximum slump; no admixtures without Engineer's approval.

2.04 FLOWABLE FILL FOR BACKFILLING

A. Materials

1. Use Fly Ash with a maximum loss on ignition of 12% and meet the other requirements of ASTM C618 (Class F).

2. Ensure water meets the requirements of ASTM C94/C94M.

3. ASTM C150/C150M or ASTM C595/C595M, Type I or Type IA.

B. Mixture (Strength 100 to 120 psi)

1. Fly Ash: 2,000 lbs per cyd min

2. Cement: 70 lbs per cyd min

3. Water: Sufficient water to produce desired flowability 700 lbs per cyd

C. Maintain the temperature of the flowable fill mix at a minimum of 50 degrees Fahrenheit during manufacture and delivery.

D. The flowable fill can be mixed by pugmill, central concrete mixer, ready mix truck, turbine mixer, or other acceptable equipment or method.

PART 3 EXECUTION

3.01 DEWATERING

A. Dewater the area within the vicinity of the trenching operation in accordance with Section 31 23 19 prior to the trenching operation.

B. Ensure the depth of dewatering is sufficient to allow trench excavation, backfilling, and compacting to proceed in a dry condition.

3.02 TRENCH EXCAVATION

A. Include site clearing and grubbing, excavation of all encountered materials, supporting and protecting structures and/or utilities above and below ground, and removal of water from the construction site in open cut trench excavation.

B. Commence the trenching operation at the downstream or outlet end of the new Work and proceed upstream, unless otherwise specified on the Plans or directed by the Engineer.

C. Excavate the trench in reasonably close conformity with the lines and grades specified on the Plans or as established by the Engineer.

D. Temporarily store excavated materials along the trench without causing damage to trees, shrubs, fences, improvements, utilities, private or public property, or traffic. Avoid placing excavated materials in locations that endanger trench banks by imposing loads.

E. Excavate the trench for rigid pipe to a width sufficient to provide adequate working space for pipe installation and compaction of bedding material under and around the pipe. Ensure the width of the trench from below the pipe bedding to 12 inches above the top of the pipe does not exceed the following dimensions:

Diameter of Pipe	Width of Trench
6 thru 12 inch pipe	30 inches wide
15 thru 36 inch pipe	outside diameter plus 16 inches
42 thru 60 inch pipe	outside diameter plus 20 inches
over 60 inch pipe	outside diameter plus 24 inches

1. When the maximum trench width specified for rigid pipe is exceeded, install at Contractor's expense, concrete encasement to support the additional load of the backfill. Completely surround the pipe with encasement having a minimum thickness of 1/4 the outside diameter of the pipe or 4 inches, whichever is greater; or at Contractor's expense, install another type bedding, approved by the Engineer. Use 3,000 psi strength concrete for the encasement.

F. For flexible pipe, ensure the minimum trench width is not less than the greater of the pipe outside diameter plus 16 inches or the pipe outside diameter times 1.25, plus 12 inches. Do not exceed the minimum width by more than 6 inches for the maximum trench width.

1. When the maximum trench width specified for flexible or semi-rigid pipe is exceeded, install at Contractor's expense, crushed stone bedding material to the full width between undisturbed trench walls or at least 2.5 pipe diameters on each side of the pipe to support the additional load of the backfill.

G. When proper alignment and grade cannot be maintained due to construction procedure or unsuitable ground conditions, excavate below the normal trench bottom grade at Contractor's expense. Fill the void with large size aggregate or 3,000 psi (21 MPa) concrete as approved by the Engineer to ensure the pipe maintains correct alignment and proper grade when laid in the proper bedding.

H. Brace and/or sheet trench excavations, including those for shafts and structures, adequately to prevent caving or squeezing of the soil.

3.03 SHEETING, SHORING, AND BRACING

A. Furnish, place, and maintain sheeting, shoring, and bracing of the trench and/or shaft as required to ensure the safety of workmen and protect the new Work, adjacent structures, including pavement, curbs, sidewalks, pipelines, and conduits next to or crossing the trench, and to protect pedestrian and vehicular traffic.

B. Take full responsibility for the complete design of all sheeting, shoring, and bracing Work. Design for the specific soil conditions and ensure strength, quality, dimension, and spacing sufficient to prevent caving, ground loss, or squeezing within the neat lines of the excavation, and to effectively restrain movement of adjacent soil.

C. Submit plans for installing sheeting, shoring, or bracing to the Engineer for informational purposes prior to installation.

D. Conform sheeting, shoring, bracing, and excavation to current federal or state safety regulations.

E. Install and leave sheeting, shoring, and bracing in place where indicated on the Plans and necessary in the Work. Do not pay additional compensation to Contractor for sheeting, shoring or bracing left in place.

F. Conform supports for pipes, conduits, etc. crossing the trench to the requirements of the facility owners and leave them in place if necessary.

G. Furnish, place, brace, maintain, and remove sheeting, shoring, and trenching materials at the Contractor's expense.

H. Do not remove trench sheeting, shoring, and bracing until the pipe is properly bedded and the trench backfilled to sufficiently support external loads.

I. Install sheeting, shoring, and bracing material without contact with the pipe, preventing concentrated loads or horizontal thrusts from transmitting to the pipe.

3.04 PIPE BEDDING

A. Install and compact in 6 inch layers. Take particular care to fill and tamp all spaces under, around, and above the top of the pipe. Work by hand in and around the pipe to provide uniform support.

B. Rigid Pipe Bedding:

1. Conform rigid pipe bedding to ASTM C1479, except as noted.

2. Class R-A:

a. Bed pipe in crushed stone material on the trench bottom. Ensure bedding has a minimum thickness beneath the pipe of 4 inches or 1/4 of the outside diameter of the pipe, whichever is greater, and extends up the sides of the pipe to the horizontal centerline.

b. Cover the top half of the pipe with a monolithic plain concrete arch having a thickness of at least 4 inches or 1/4 of the inside diameter of the pipe, whichever is greater, at the pipe crown, and a minimum width equal to the outside diameter of the pipe plus 8 inches or 1-1/4 of the diameter of the pipe, whichever is greater.

3. Class R-B:

a. Bed the pipe in crushed stone bedding material placed on the trench bottom. Ensure the bedding has a minimum thickness beneath the pipe of 4 inches or 1/8 of the outside diameter of the pipe, whichever is greater, and extends up the sides of the pipe to the horizontal centerline.

b. Backfill from pipe horizontal centerline to a level not less than 12 inches above the top of the pipe using granular material Class II. Place this material in 6 inch layers and thoroughly compact each layer by mechanical means until the finished compacted material reaches a minimum of 12 inches above the top of the pipe.

4. Class R-C:

a. Bed the pipe in granular material Class II placed on the trench bottom. Ensure the bedding has a minimum thickness beneath the pipe of 4 inches or 1/8 of the outside diameter of the pipe, whichever is greater, and extend the bedding to a level not less than 12 inches above the top of the pipe.

b. Place this material in 6 inch , thoroughly compact each layer by mechanical means, and ensure the finished compacted material reaches a minimum 12 inches above the top of pipe.

C. Flexible Pipe Bedding:

1. Conform flexible pipe bedding to ASTM D2321, except as noted.Provide a continuous and uniform bedding in the trench for all buried pipe.

2. Class F-I:

    a. Bed the pipe in crushed stone bedding material placed on the trench bottom. Ensure the bedding has a minimum thickness of 4 inches and beneath the pipe and extends up the sides until the top of the pipe is covered by at least 12 inches of material.

    b. Use bedding to the full width between undisturbed trench walls where allowable trench widths are exceeded. Do not use concrete cradle bedding.

3. Class F-II:

    a. Bed the pipe in crushed stone bedding material placed on the trench bottom. Ensure the bedding has a minimum thickness beneath the pipe of 4 inches or 1/8 of the outside diameter of the pipe, whichever is greater, and extends up the sides of the pipe to the horizontal centerline.

    b. Backfill from pipe horizontal centerline to a level not less than 12 inches above the top of the pipe using granular material Class II. Place this material in 6 inch layers and thoroughly compact each layer by mechanical means until the finished compacted material reaches a minimum of 12 inches above the top of pipe.

    c. Use bedding to the full width between undisturbed trench walls where allowable trench widths are exceeded. Do not use concrete cradle bedding.

4. Class F-III:

    a. Bed the pipe in granular material Class II placed on the trench bottom. Ensure the bedding has a minimum thickness beneath the pipe of four 4 inches or 1/8 of the outside diameter of the pipe, whichever is greater, and extends to a level not less than 12 inches above the top of the pipe. Place this material in 6 inch layers and thoroughly compact each layer by mechanical means until the finished compacted material reaches a minimum of 12 inches above the top of the pipe.

    b. Use bedding to the full width between undisturbed trench walls where allowable trench widths are exceeded. Do not use concrete cradle bedding.

3.05 BACKFILLING TRENCHES

A. Place backfill material on sections of bedded pipes only after receiving approval from the Engineer for the pipe bedding and backfill materials.

B. Follow pipe laying with trench backfilling as closely as possible. Do not allow pipe laying in any trench to precede backfilling by more than 100 feet, unless otherwise directed by the Engineer.

C. Do not perform backfilling in freezing weather except by permission of the Engineer. Avoid using frozen materials in trench backfilling.

D. Use the following trench backfill specifications for the portion of the trench beyond the pipe bedding, which normally ends 12 inches above the top of the pipe. Place backfill material above the pipe bedding free of cinders, ashes, refuse, boulders, roots, stumps, trees, timbers, brush, debris, or other materials deemed unsuitable by the Engineer. Do not place rocks or stones larger than 6 inches within three 3 feet of the top of the pipe. Place large stones in the remainder of the trench backfill only if well separated and arranged to avoid interference with backfill settlement.

E. Conform the type and method of backfilling to the following requirements based on its location and function:

1. Trench B:

a. Backfill trenches under road surfaces, pavement, curb, driveway, sidewalk, and where the trench edge is within three 3 feet of the pavement, as well as areas noted on the Plans, with natural bank run sand meeting the requirements of granular material Class II, unless otherwise indicated on the Plans.

b. Backfill trenches under pavement to be constructed in the near future, as noted or shown on the Plans, with natural bank run sand meeting the requirements of granular material Class II, unless otherwise indicated on the Plans.

c. Where a pipe is installed under an existing or proposed utility, backfill between the two with natural bank run sand meeting the requirements of granular material Class II, unless otherwise indicated on the Plans, and construct as herein specified.

d. Place the material in uniform layers that can be adequately compacted and tested from the surface of each layer. Compact each layer to 95% of the material’s maximum unit weight, unless otherwise specified on the Plans or by the Engineer.

2. Trench A;

a. Backfill trenches with suitable excavated material placed in uniform layers that can be adequately compacted and tested from the surface of each layer.

b. Thoroughly compact each layer by approved mechanical methods to a density equivalent to the undisturbed adjacent soil or 90% of its maximum unit weight, whichever is less.

3. Carry trench backfill to the level of the adjacent existing ground or proposed grade, whichever is higher, unless otherwise specified on the Plans or directed by the Engineer.

4. Use care to avoid displacing any pipes or structures due to fluid pressure where flowable fill is used for backfill or bedding as shown on the Plans or specified. Secure pipes in backfill areas as needed to counteract the buoyancy effect.

3.06 COMPACTING BACKFILL

A. Do not pay separately for backfill compaction; consider it incidental to the work of pipe installation and backfilling, including all soil manipulation to achieve the specified densities. Do not allow additional compensation for delays required to obtain the specified moisture content or density.

3.07 CLEANUP

A. Immediately remove and dispose of excess material by the Contractor, at the Contractor's expense, as specified in Section 01 89 00, following the placing and compacting of the backfill. Level the construction area and leave it in a neat, workmanlike condition.

B. Rake the disturbed area at a seasonally correct time approved by the Engineer, place topsoil thereon, and restore the area.

1. Restore the area with seed, fertilizer, and mulch according to the requirements of Section 32 92 19 .

2. Restore with sod in accordance with Section 32 92 23.

3.08 FIELD TESTING

A. Conduct testing for compaction or density of the backfill during the Work when required by the Engineer. Perform sampling and testing through a testing laboratory suitable to the Owner and approved by the Engineer.

B. Define the maximum unit weight, when measuring soil compaction or density, as the maximum unit weight per cubic foot or cubic meter determined by ASTM D1557, Method C.

3.09 DEFECTIVE WORK

A. Correct any portion of the trench backfill deficient in the specified density using methods approved by the Engineer.

B. Charge additional testing or sampling required due to deficiencies to the Contractor's expense.

END OF SECTION

SECTION 32 11 23 - AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes aggregate base courses complete with aggregate materials constructed in preparation for paving or aggregate surfacing.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 89 00 - Site Construction Performance Requirements

C. Section 31 23 13 - Subgrade Preparation

D. Section 32 12 16 - Bituminous Paving

1.03 REFERENCE STANDARDS

A. Unless otherwise specified, conform the work for this section to the applicable portions of the following Standard Specifications.

1. ASTM D98: Standard Specification for Calcium Chloride

2. ASTM D1557: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))

3. Michigan Department of Transportation (MDOT), Standard Specifications for Construction, latest edition

1.04 ALLOWABLE TOLERANCES

A. Shape the finished surface to conform to plan grade and cross section within a tolerance of 3/4 inch in 10 feet.

1.05 TEST REPORTS

A. The testing lab must provide the Engineer with two (2) certified copies of the test results of the thickness of the compacted aggregate. The core drilling, testing for thickness and the certification of the test results must be performed by a testing laboratory approved by the Engineer.

1.06 STOCKPILING AGGREGATE

A. Deposit aggregate in stockpiles. Remove material from stockpiles using methods that provide aggregate with uniform gradation.

B. Stockpiling of aggregate, in excess of 4 feet in depth, on the completed subbase or aggregate surface will not be permitted, except with the approval of the Engineer.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Comply with the requirements for aggregate base or surfacing installations due to outside ambient air temperatures specified in Part 3 of this Section.

PART 2 PRODUCTS

2.01 DENSE-GRADED AGGREGATE

A. Conform dense-graded aggregate gradation to Class 21 and 22, as specified in MDOT Section 902.05.

2.02 CALCIUM CHLORIDE ADDITIVES

A. Conform calcium chloride additives to ASTM D98 and as specified in MDOT Section 922.12.

2.03 WATER

A. Use reasonably clean water for compaction and dust control; ensure it is free from substances injurious to the finished product. Use potable water from Michigan State Department of Public Health-approved sources.

PART 3 EXECUTION

3.01 EXCAVATION VERIFICATION

A. Prior to the placing of any aggregate material, examine the excavation for the grades, lines, and levels required to receive the new Work.

B. Ascertain that excavation and compacted subgrades or subbases are adequate to receive the new Work.

C. Correct defects and deficiencies before proceeding with the Work.

3.02 SUBGRADE CONDITIONS

A. Prior to the placing of any aggregate material, examine the subgrade or subbase to ascertain that it is adequate to receive the aggregate to be placed.

B. If the subgrade or subbase remains wet after all surface water has been removed, the Engineer may require the installation of edge drain.

3.03 EXISTING IMPROVEMENTS

A. Investigate and verify locations of existing improvements, including structures, to which the new Work will be in contact. Necessary adjustments in line and grade, to align the new Work with the existing improvements must be approved by the Engineer, prior to any changes.

3.04 PREPARATION OF SUBGRADE OR SUBBASE

A. Fine grade subgrade or subbase to the cross section indicated on the Plans. Compact it thoroughly prior to placing the aggregate material.

3.05 INSTALLATION - GENERAL

A. Indicate width, thickness, and type of aggregate materials on the Plans or as directed by the Engineer.

B. Do not place aggregate material until the Engineer approves the subgrade, subbase, or existing aggregate surface.

3.06 INSTALLATION OF AGGREGATE BASE COURSE

A. Place aggregate base course with a mechanical spreader or other approved means. Spread it in uniform layers to a depth that, when compacted, achieves the thickness shown on the Plans.

B. Compacted, the depth of any one layer must not exceed 8 inches. If unable to achieve required compaction for the full aggregate base course depth, reduce the thickness of each course. Alternatively, with Engineer approval, use adequate equipment to compact the aggregate to the required unit weight.

C. Shape the subgrade or subbase to the specified crown and grade. Maintain it in a smooth condition. If hauling equipment causes ruts or holes, do not permit it on the subgrade or subbase; operate it on the aggregate base course behind the spreader instead.

D. Compact aggregate to at least 98% of maximum unit weight by the use of approved pneumatic-tired compaction equipment or vibratory compactors.

E. Maintain optimum moisture content until achieving the prescribed unit weight. Compact each layer until attaining the maximum unit weight before placing the succeeding layer.

F. When approved by the Engineer, additional water may be applied to the aggregate by an approved means to aid in the compaction and shaping of the material.

G. Use motor graders, trimmers, or other approved equipment to shape and maintain the aggregate base course until placing the surface course.

H. Limit the weight and speed of equipment when hauling material over the base course, subbase, or subgrade to avoid damage. If operations cause rutting in the subgrade, subbase, or aggregate base course, remove and replace the damaged sections until acceptable to the Engineer, at the Contractor's expense.

I. With the approval of the Engineer, chloride additives may be used by the Contractor to facilitate his compaction and maintenance of the aggregate surface. The amount and method of combining the chloride additives are at the option of the Contractor and are at Contractor's expense.

3.07 MAINTENANCE DURING CONSTRUCTION

A. Continuously maintain aggregate base course and aggregate surface in a smooth and firm condition during all phases of the construction operation.

B. Provide additional materials at the Contractor's expense to fill depressions or bind the aggregate.

3.08 TEMPERATURE LIMITATIONS

A. Do not place aggregate materials when indications show the mixtures may freeze before reaching maximum unit weight.

B. Do not place aggregate on a frozen subgrade or base course unless approved by the Engineer.

3.09 TESTING

A. Allow the Engineer to require testing for compaction, density, and thickness of material during the course of the Work. Perform required testing and coring through a testing laboratory

acceptable to the Owner and approved by the Engineer. Charge the cost for testing and coring to the Owner.

B. Make a minimum of one depth (thickness) measurement every 400 feet per traffic lane when performing thickness tests. Use the lane width indicated on the Plans or as determined by the Engineer.

1. If two (2) lanes are constructed simultaneously, only one test is necessary to represent both lanes.

2. For areas such as intersections, entrances, cross-overs, ramps, widening strips, acceleration and deceleration lane, at least one depth measurement will be taken for each 1200 square yards of such areas or fraction thereof.

C. Location of the depth measurement will be at the discretion of the Engineer.

D. Understand maximum unit weight to mean the maximum unit weight per cubic foot as determined by ASTM D1557, Method A.

3.10 DEFECTIVE WORK

A. Thickness:

1. Measurements of aggregate base course thickness will be made to the nearest 1/4 inch.

a. Allow depths to be 1/2 inch less than the thickness indicated on the Plans, provided the average of all measurements taken at regular intervals equals or exceeds the specified thickness.

b. In determining the average in place thickness, measurements which are more than 1/2 inch in excess of the thickness indicated on the Plans will be considered as the specified thickness plus 1/2 inch.

2. Specify locations of depth measurements as stated herein unless the Engineer determines otherwise. Correct sections deficient in depth using methods approved by the Engineer.

B. Weight

1. When the aggregate material is measured by weight in tons, the pay weights for aggregates will be the scale weight of the material, including admixtures, unless the moisture content is more than 6 percent .

a. Moisture tests will be made at the start of weighing operations and at any time thereafter when construction operations, weather conditions or any other cause may result in a change in the moisture content of the material.

b. If the tests indicate a moisture content in excess of 6 percent, the excess over 6 percent will be deducted from the scale weight of the aggregate until such time as moisture tests indicate that the moisture content of the material is not more than 6 percent.

END OF SECTION

SECTION 32 12 16 - BITUMINOUS PAVING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes bituminous paving complete with bituminous materials; bituminous mixtures; installation of bituminous base course, bituminous wearing course, and bituminous curbs; construction of bituminous pavement, sidewalks, drive approaches, and tennis courts; cold milling; and pulverizing existing pavements.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 33 00 - Submittal Procedures

C. Section 01 89 00 - Site Construction Performance Requirements

D. Section 31 11 00 - Clearing and Grubbing

E. Section 31 23 13 - Subgrade Preparation

F. Section 32 11 23 - Aggregate Base Courses

G. Section 32 17 23 - Pavement Markings

H. Section 32 92 19 - Seeding

I. Section 32 92 23 - Sodding

1.03 REFERENCE STANDARDS

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

1. AASHTO M 17 - Standard Specification for Mineral Filler for Bituminous Paving Mixtures
2. AASHTO M 29 - Standard Specification for Fine Aggregate for Asphalt Mixtures
3. AASHTO M 81 - Standard Test Methods and Practices for Emulsified Asphalts
4. AASHTO M 82 - Standard Specification for Cutback Asphalt (Medium-Curing Type)
5. AASHTO T 180 - Standard Method of Test for Moisture–Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
6. ASTM D244 - Standard Test Methods and Practices for Emulsified Asphalts
7. ASTM D692/D692M - Standard Specification for Coarse Aggregate for Asphalt Paving Mixtures
8. ASTM D1073 - Standard Specification for Fine Aggregate for Asphalt Paving Mixtures
9. ASTM D2026 - Standard Specification for Cutback Asphalt (Slow-Curing Type)
10. ASTM D2027/D2027M - Standard Specification for Cutback Asphalt (Medium-Curing Type)
11. ASTM D2028 - Standard Specification for Cutback Asphalt (Rapid-Curing Type)

12. American Association of State Highway and Transportation Officials
13. Michigan Department of Transportation (MDOT), Standard Specifications for Construction, latest edition
14. Michigan Asphalt Paving Association

1.04 ALLOWABLE TOLERANCES

A. Following the final rolling, the surface will be tested longitudinally using a 10 foot straight edge at locations selected by the Engineer. The variation of the surface from the testing edge of the straightedge between any two contacts with the surface will at no point exceed the following limits:

1. For Bituminous Base Course Mixtures:
    a. Multiple Courses:
        1) 3/8 inch for top course
        2) 3/4 inch for lower courses
2. For Bituminous Surface Course Mixtures:
    a. Multiple Courses:
        1) 1/8 inch for top course
        2) 1/4 inch for lower courses
    b. Single Course:
        1) 1/4 inch
3. Variations in excess of the specified tolerance must be corrected as determined by the Engineer.

1.05 MATERIAL REPORTS

A. At the request of the Engineer, the Contractor must provide the Engineer with certification that the various materials to be used conform to the Standards referred to in the Specifications.

B. Contractor must provide the Engineer with the load tickets prior to the placing of the materials.

C. Contractor must supply the Engineer with a certified Job Mix Formula for each type of bituminous mixture proposed for use on this Project.

1.06 TEST REPORTS

A. The testing lab will provide the Engineer with two (2) certified copies of the test results of the mix design and the thickness of the bituminous paving material.

B. The core drilling, testing for mix design and thickness, and the certification of the test results will be performed by a testing laboratory approved by the Engineer.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Comply with the requirements for bituminous concrete installation due to outside ambient air temperatures specified under this Section.

PART 2 PRODUCTS

2.01 BLENDED AGGREGATE

A. Blended aggregate must conform to:

1. AASHTO M29
2. ASTM D692/D692M
3. ASTM D1073
4. MDOT Sections 501 and 902

2.02 MINERAL FILLER

A. The mineral filler gradation must conform to:

1. AASHTO M17
2. Mineral filler, 3MF, as specified in _____

2.03 ANTI-FOAMING AGENTS

A. The anti-foaming agents must conform to anti-foaming agents, as specified in:

1. MDOT Section 904.

2.04 ASPHALT BINDER

A. Asphalt binder for use in production of bituminous mixtures must be performance graded asphalt binder:

1. PG58-28 per MDOT Section 904 unless otherwise indicated on the Plans.

2.05 LIQUID ASPHALTS

A. Liquid asphalts for use in pavement construction must conform to:

1. ASTM D2026
2. ASTM D2027/D2027M
3. ASTM D2028
4. AASHTO M81
5. AASHTO M82
6. MDOT Section 904

2.06 EMULSIFIED ASPHALT (BOND COAT)

A. Emulsified asphalt for use in pavement construction must conform to:

1. ASTM D244

2. MDOT Section 904

2.07 COMPOSITION OF MIXTURES

A. Bituminous mixtures must be mixed and placed in accordance with applicable requirements specified in MDOT Section 501 except as otherwise specified in this Section.

B. The blended aggregate used for the bituminous wearing course on this Project must have an Aggregate Wear Index (AWI) of 260, or higher.

C. The aggregates, mineral filler (if required), and asphalt binder must be combined as necessary to produce a mixture of the type as specified on the Plans.

1. Superpave Hot Mix Asphalt Mixtures must be in accordance with MDOT Section 501.

2. Marshall Hot Mix Asphalt Mixtures must be in accordance with MDOT Section Special Provision 20SP-501X-01 (latest edition).

D. The bituminous mixture specified on the Plans or in the Proposal, when tested at optimum asphalt content (determined in accordance with MDOT "Procedures for Mix Design Processing"), must meet the requirements for stability, flow, voids in mineral aggregate (VMA), air voids, fines/binder ratio, fine aggregate angularity, L.A. Abrasion loss, and soft particles as specified for the type of mix.

E. Mixtures failing to meet the requirements specified will be rejected and the Contractor will be required to submit additional samples of bituminous mixtures until a combination of material is found which will produce a mixture meeting the requirements.

F. If there is a change in the source of any of the aggregates, a new job-mix formula will be required.

G. After the job-mix formula is established, the aggregate gradation and the asphalt binder content of the bituminous mixture furnished for the Work must be maintained within the Range 1 uniformity tolerance limits permitted for the job-mix formula as specified in "Uniformity Tolerance Limits" table below.

1. If two (2) consecutive aggregate gradations on one (1), or asphalt binder contents as determined by the field extractions are outside the Range 1 but within the Range 2 uniformity tolerance limits, the Contractor will suspend all operations. Work days will be charged during the down time.

2. Before resuming any production, the Contractor will make necessary alterations to the materials or plant so that the Job Mix Formula can be maintained within the deviations permitted per Table 1.

Table 1 - Uniformity Intolerance Limits

Type of Course	Range (a)	(b)	Percentage Passing Designated Sieves			Asphalt Binder Content
			No. 8	No. 30	No. 200	
Top and Leveling	Range 1	± 5.0	± 5.0	± 4.0	± 1.0	± 0.40
	Range 2	± 8.0	± 8.0	± 6.0	± 2.0	± 0.50
Base Courses	Range 1	± 7.0	± 7.0	± 6.0	± 2.0	± 0.40
	Range 2	± 9.0	± 9.0	± 9.0	± 3.0	± 0.50

Table 1 - Uniformity Intolerance Limits
(a) This range allows for normal mixture and testing variations. The mixture will be proportioned to test as loosely as possible to the Job Mix Formula
(b) This includes all sieve sizes No. 4 and larger listed on the Job Mix Formula

H. Mixtures exceeding the maximum tolerances listed in the table, or exceeding the maximum limits specified for the master gradation range will be rejected and the Contractor may be required to remove and replace any bituminous pavements which the Engineer determines were constructed with mixtures in the excess of these tolerances.

I. Contractor will provide uniformity in the gradations of the aggregates placed in the cold feed bins so that the combination of aggregates produced for the mixture by blending the aggregates from two (2) or more cold feed bins will be uniformly fed by means of adjustable feeders onto a belt supplying the asphalt plant.

1. Feeders will be equipped with cutoffs which will automatically stop the operations to the asphalt plant at any time the flow of any aggregate fraction is changed so as to affect the uniformity of the finished product.

J. Contractor has the option of using hot bins for proportioning the aggregates to meet the specified tolerances.

K. Aggregate gradation tests will be made on aggregate extracted from samples of bituminous mixture taken from the trucks as directed by the Engineer.

1. As a general guideline, samples will be taken at initial start of production and at other times when tests indicate that the aggregate gradation is fluctuating, truck samples will be taken at a frequency of one sample per 250 Tons of mixture, but not more than four samples per day.

2. During other periods where tests indicate the aggregate gradation is stable, truck samples will be taken at a frequency of one sample per 500 Tons of mixture, but no more than two samples per day.

L. Exact mixture proportions will be based on composite samples of aggregate and the particular bituminous material called for on the Plans.

PART 3 EXECUTION

3.01 EXCAVATION

A. Prior to the installation of bituminous concrete pavement, Contractor will examine the excavation for the grades, lines, and levels required to receive the new Work. Ascertain that excavation and compacted subgrades are adequate to receive the bituminous pavement to be installed. Correct defects and deficiencies before proceeding with the Work.

3.02 SUBGRADE AND BASE COURSE CONDITIONS

A. Prior to the installation of any bituminous pavement, Contractor will examine the subgrade and base course to ascertain that it is adequate to receive the bituminous concrete pavement to be installed. If the subgrade remains wet after surface water has been removed, the Engineer may require the installation of edge drain.

3.03 EXISTING IMPROVEMENTS

A. Contractor will investigate and verify location of existing improvements, including structures, to which the new Work is to be connected. Adjustments in line and grade to align the new Work with the existing improvements must be approved by the Engineer, prior to any changes.

3.04 EQUIPMENT REQUIREMENTS

A. General:

1. Contractor will furnish sufficient equipment for completing the Work in a timely and efficient manner.

2. Equipment will be on the job site and ready for normal operation before the placing of material is started.

3. Equipment will be in good working order. Equipment will be subject to inspections and testing during construction.

4. Equipment will be of sufficient capacity that the operation can be continuous, and a rate of production obtained which ensures good workmanship and eliminates overloading of the equipment or frequent interruptions or delays.

5. Equipment will conform to the requirements as specified in MDOT Section 501 and as specified herein.

B. Pavers:

1. Paver will be an approved self-powered machine capable of spreading and finishing the mixture in a uniform layer at the desired thickness and cross section and ready for compaction. The use of any machine in poor mechanical or worn condition, will not be permitted. Paver will be of such design that the supporting wheels, treads, or other devices ride on the prepared base. The full width of surface being applied will be screeded by an oscillating or vibrating screed.

2. Paver will at all times produce a uniformly finished surface, free from tearing or other blemishes that would require hand work. The screed will be adjustable to provide for tilting to secure the proper dray or compressive action necessary to produce the desired surface texture.

3. Paver will be equipped with a hopper and an automatic material-depth control device so that each distributing auger and corresponding feeder will respond automatically to provide for a constant level of mix ahead of the screed unit to the full width of the lane being paved.

4. To ensure that adequate material will be fed to the center portion of the lane being paved, reverse pitch augers or paddles will be installed at the inside of one or both ends of the auger shafts to force the mix to the middle portion of the lane. If necessary to prevent segregation of the mix as it drops off the feed conveyor, baffle plates will be installed at the required location.

5. When extensions are added to the paver, they will be provided with the same vibrating screed or tamper action as the main unit of the paver, except for paving variable width areas. The extensions will also be equipped with a continuation of the automatically controlled spreading augers. The screed and any extensions will be provided with an approved method of heat distribution.

6. Unless specified otherwise, bituminous pavers will be equipped with an automatically controlled and activated screed and strike-off assembly capable of grade reference and transverse slope control.

    a. A manufacturer approved grade referencing attachment, not less than 30 feet in length, will be used for all lower courses and the first lane of the wearing course.

    b. After the first lane of the wearing course has been placed, a 10 feet or longer grade referencing attachment may be substituted for constructing subsequent adjacent lanes of wearing course mixture.

7. A self-propelled mechanical spreader capable of maintaining the proper width, depth, and slope without causing segregation of the material, may be used for base courses and for surface courses less than 8 feet in width.

8. When surfacing ramps or shoulders, or when the grade of a concrete gutter or other existing installation must be met, the manner of use of the automatic grade reference and slope control devices will be as approved by the Engineer.

9. Whenever a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually for the remainder of the normal working day, provided this method of operation will produce results meeting the specification requirements.

C. Crushing Equipment:

1. Crushing equipment for pulverizing existing bituminous base course will be an approved rotary reduction machine having positive depth control adjustments in increments of 1/2 inch and capable of reducing material which is at least 6 inches in thickness.

2. The machine will be of a type designed by the manufacturer specifically for reduction in size of pavement material, in place, and be capable of reducing the pavement material to the specified size. The cutting drums will be enclosed and will have a sprinkling system around the reduction chamber for pollution control.

3. The rate of forward speed must be positively controlled to ensure consistent size of reduced material. The machine must be equipped with an accurate tachometer which is mounted in full view of the operator.

4. Crushing equipment must meet the approval of the Engineer.

D. Cold Milling Machine:

1. Cold milling machine for removing concrete or bituminous surfaces will be equipped with automatically controlled and activated cutting drums that are capable of grade reference, transverse slope control, and produce a uniformly textured surface. An approved grade referencing attachment, not less than 30 feet in length will be used.

2. Equipment for removing the concrete or bituminous surface will be capable of accurately removing the surface, in one or more passes, to the required grade and cross section.

E. Joint Heaters:

1. Joint heaters will be infrared or other approved heaters, equipped with an automatic ignition and extinguishing system to ensure that the heater operates only when the paver is

moving. It must be of sufficient length and heating capacity to adequately soften the edge of the mat. The heater will be oriented parallel to the joint edge.

2. Bituminous pavement will not be heated by a direct open flame.

F. Rollers:

1. Steel-wheel rollers will weigh at least 8 tons and must be self-propelled, vibratory or static, tandem rollers or must be self-propelled static 3-wheel rollers.

   a. Steel-wheel rollers will be free from backlash, faulty steering mechanism, or worn king bolts. The steering device will respond readily and permit the roller to be directed on the alignment desired.

   b. Rollers will be equipped with wheel sprinklers and scrapers.

   c. Roller wheels will be smooth and free from openings or projections which will mark the surface of the pavement.

2. Vibratory rollers will have a shutoff to deactivate the vibrators when the roller speed is less than 0.5 mph and will have provisions to lock in the manufacturer's recommended speed, vibrations per minute, and amplitude of vibration (dynamic force) for the type of bituminous mixture being compacted.

3. The pneumatic-tired roller will be of the self-propelled type with a total weight, including ballast, not greater than 30 tons.

   a. It must be equipped with a minimum of seven (7) wheels situated on the axles in such a way that the rear group of tires will not follow in the tracks of the forward group, but will be so spaced that a minimum tire path overlap of 1/2 inch is obtained.

   b. The tires must be smooth and must be capable of being inflated to or adapted to achieve a pressure necessary to provide ground-contact pressures of at least 80 psi.

   c. The tire pressures must not vary by more than 5 psi between individual tires. Contractor must furnish a tire gage which will be available to enable the Engineer to check the tire pressures.

   d. Contractor must furnish the Engineer charts or tabulations showing the contact areas and the contact pressures for the full range of tire inflation pressures and tire loadings for the type and size roller used.

4. Roller must be equipped with a mechanism capable of reversing the motion of the roller smoothly.

5. Roller must be equipped with wheel sprinklers and scrapers or mats.

6. Rollers must be of sufficient size to compact the bituminous mixture to the required density without tearing, displacing, or cracking the mat.

G. Chip Spreader:

1. Chip spreader must be self-propelled and must be equipped with pneumatic tires.

2. Spreader will be equipped with a screen mounted below the metering gage.

3. Spreader must be capable of spreading the cover material uniformly at widths of 3 to 12 feet, or separate spreaders will be provided for the specific widths required.

4. Rate of discharge of the spreader will be adjustable to spread uniform layers of 10 to 50 pounds per square yard.

H. Bituminous Concrete Curbing Machine:

1. Bituminous concrete curbing machine must be self-propelled and must be capable of laying and satisfactorily compacting curved and straight line curb to the cross section specified on the Plans. It must be equipped with templates for the cross sections required.

3.05 PREPARATION OF FOUNDATIONS

A. For bituminous base course mixtures required to be placed directly on the subgrade, the density, grade and cross section must meet the approval of the Engineer at the time of placement of any mixture.

B. Prior to placing any bituminous mixture, the surface of any existing pavement, including joints and cracks, must be thoroughly cleaned of all dirt and debris.

C. Existing structures within the limits of the new Work must be adjusted as specified in the Plans, or as determined by the Engineer.

3.06 PREPARATION OF AGGREGATE BASE

A. Prior to the placing of prime coats or bituminous mixtures, density, grade and cross section of the aggregate base must meet the approval of the Engineer.

B. Surfaces that have become too wet or too dry must be reworked to provide the required density.

3.07 PREPARATION OF EXISTING PAVEMENT

A. This Work consists of preparation of the existing concrete road for resurfacing. Broken pavement or pavement not bonded to the base pavement, and loose bituminous surfacing or patches must be removed.

B. Longitudinal and transverse joints and cracks will be cleaned in accordance with Article 3.14 - Joint Cleaning of this Section.

C. Butt joints at the end of surfacing sections and at intersections of adjoining streets must be made in accordance with Article 3.08 - Butt Joints of this Section. The vertical face of the cut will be maintained true, straight and undamaged until installation of wearing course.

3.08 BUTT JOINTS

A. If butt joints are specified on the Plans, or by the Engineer, the old surface will be cut back for at least 5 feet to a depth of at least 1 inch for the full width of the joint. The vertical face of the cut will be maintained true, straight and undamaged until installation of wearing course.

3.09 EDGE TRIMMING

A. Trimming and truing the edge of an existing bituminous surface will be performed as required to give a straight, sharp edge at the proper elevations.

B. The existing base under the bituminous surface will be left undisturbed.

3.10 REMOVING BITUMINOUS SURFACING

A. When removing existing bituminous surface course, the edges of the area to be removed will be cut along straight lines, either perpendicular to or parallel to the direction of travel, for the full depth of the full depth of the surface course; with the cut edge a minimum of 18 inches back from the disturbed edge of pavement.

B. The cutting of the edges and the breaking up of the bituminous material within the removal area; and the removing and disposing of the unsuitable material are included in the Work of removing bituminous surfacing.

3.11 REMOVING BITUMINOUS PATCHES

A. Where the removal of bituminous patching material is specified on the Plans or as determined by the Engineer, it will be saw cut along the edges of the patched area to prevent the tearing of adjoining pavement surfaces during the removal operation.

B. The cutting, removing and disposing of bituminous surfacing and unsuitable materials are included in the Work of removing bituminous patches.

3.12 PULVERIZATION AND SHAPING OF EXISTING BITUMINOUS BASE COURSE

A. This Work consists of scarifying, pulverizing, milling, crushing, adding new material if required, shaping, rolling, compacting, and proof rolling the crushed base to the proper elevation and slope.

B. Additional materials required to fill holes and voids will be furnished at the Contractor’s expense. Additional aggregate, if required, will be MDOT 21A.

C. The material will be scarified and uniformly pulverized to a maximum size of 2 inches, in addition, 95-100 percent of the material must have a particle size of 1-1/2 inches or smaller.

D. The material will be scarified and uniformly pulverized, in one or more passes, to the depth specified on the Plans or as determined by the Engineer.

E. The maximum length or width of roadbed to be scarified and pulverized at any one time will be as specified on the Plans or as determined by the Engineer.

F. The crushed material will be rough graded to within 3/4 inch of the final grade as called for on the Plans or as determined by the Engineer. Additional aggregate will be placed, if necessary, to attain the required cross sections.

G. After the material has been balanced, it will be thoroughly mixed. In restrictive areas, the material to be mixed may be bladed into a windrow to provide working room for the mixer.

H. The mixed material will be shaped and compacted in reasonably close conformity with the lines, grades, and cross sections shown on the Plans or as established by the Engineer. Excess material will be removed and disposed of by the Contractor at Contractor's expense.

I. Finished rolling will be done with a vibratory steel wheel roller.

J. Aggregate-bituminous pavement mixture will be compacted to not less than 95 percent of the unit weight obtained by the AASHTO T 180 test method. The test will be made on the

aggregate-bituminous mixture at the field moisture content existing during the compacting operation. Required density will be maintained until the material has been surfaced.

K. Prior to the placing of any surface courses, the pulverized material must be proof rolled. Proof rolling will be accomplished with an 18,000 lbs single axle load.

L. Unstable areas must be removed and backfilled.

3.13 HAND PATCHING

A. Where the filling of holes and depressions in the base or the replacing of the patches is specified on the Plans or as determined by the Engineer, the filler material must be an approved bituminous mixture. The mixture selected will be dependent on the depth and size of the patch and the type of mixture and performance grade of the asphalt binder required.

B. Patches will be compacted to the required grade by use of a machine vibrator or approved roller.

3.14 JOINT CLEANOUT

A. Where joint cleanout is specified on the Plans or as determined by the Engineer, the joint sealants and foreign material will be removed to a minimum depth of 1 inch by approved mechanical or hand methods.

B. Removal and disposal of unsuitable materials and the removal and disposal of bituminous surface patches adjacent to joints are included in the Work for joint cleanout.

3.15 REPAIRING PAVEMENT JOINTS

A. Where existing pavement joints and cracks are to be repaired, as specified on the Plans or as determined by the Engineer, the existing bituminous surface and any loose or spalled concrete around the joints and cracks will be removed.

B. Each joint or crack will be cleaned and will be filled with an approved mixture and the mixture will be compacted with a vibratory machine or by an approved method.

3.16 COLD MILLING CONCRETE OR BITUMINOUS PAVEMENT

A. Where cold milling concrete or bituminous pavement is specified, the pavement will be milled to the shape and cross section as shown on the Plans. Immediately after cold milling, the surface must be cleaned.

B. Contractor will remove and dispose of resulting debris.

C. When allowed by the Engineer, milling materials may be used for temporary wedging.

1. Prior to placing pavement, temporary wedging materials must be removed and disposed of. Wedging with milled materials is incidental to the Project.

3.17 GENERAL BITUMINOUS PAVEMENT INSTALLATION REQUIREMENTS

A. The width, thickness and type of bituminous paving improvement will be specified on the Plans, indicated in the Proposal or as determined by the Engineer.

B. At street intersections, curb drops conforming to the current rules and regulations of Act 8, Michigan PA 1973, as amended, must be provided for the construction of sidewalk ramps. In

addition, curb drops for sidewalks and driveway approaches must be provided in locations called for on the Plans or as determined by the Engineer.

C. Existing improvements, including structures, will be protected to prevent their surfaces from being discolored during application of bituminous materials.

3.18 BITUMINOUS PRIME COAT OR BOND COAT

A. The prepared foundation will be treated with bituminous material for prime coat or bond coat as specified. A bond coat will be applied to each layer of bituminous mixture before the succeeding layer is placed.

B. The bituminous material will be applied uniformly by means of a pressure distributor. In areas inaccessible to the regular distributor operation, the bituminous material will be applied by means of the hand spraying apparatus of the distributor.

1. Where necessary to accommodate traffic, the surface will be treated half-width or as recommended by the Engineer.

2. The foundation will be free from moisture when the treatment is applied.

3. Under no circumstances will pools of bituminous material be allowed to remain on the surface.

C. The amount of prime coat to be applied per square yard will be 0.05 gallons per square yard unless otherwise specified on the Plans or directed by the Engineer.

D. When prime coat is applied, the surface course will not be placed until the prime coat has properly cured. No blotting of the prime coat with aggregate in lieu of proper curing will be permitted.

E. The prime coat may be omitted or reduced when authorized by the Engineer.

F. The bond coat will be applied at the rate specified or as directed by the Engineer. This rate will be between 0 to 0.10 gallons per square yard on a bituminous or concrete foundation and between 0-0.05 gallons per square yard between subsequent courses.

G. The bond coat material will be applied ahead of the paving operation for a distance of at least 1500 feet depending on traffic conditions or as determined by the Engineer. The surfacing will not be placed until the bond coat has cured.

3.19 TRANSPORTATION OF MIXTURES

A. The transportation of the mixtures as specified will be in accordance with MDOT Section 501.

3.20 PLACING BITUMINOUS MIXTURES

A. Pavers will be required to have an automatically controlled and activated screed and strike-off assembly except when placing mixtures for:

1. variable width sections

2. sections of pavement less than 1000 feet in length

3. placing the first course of a base course mixture on an earth grade or on a sand subbase

4. placing base course mixtures in widths less than 8 feet

B. Bituminous base course mixtures will not be placed in lifts exceeding unless otherwise approved by the Engineer. Approval to place lifts in excess of 3 inches will be based on the ability of the Contractor to place and compact the base course to the required cross section and within the specified tolerances.

C. For lifts of 2-1/2 inches or greater, a berm of shoulder material will be banked against the outside edge of each layer of mixture placed unless the sequence of operations is such that the edges of the material are adequately confined and supported in some other manner. The width of material placed will be twice the height of the bituminous layer being placed but in no case less than a 6 inch width.

D. When the application rate for a bituminous wearing course exceeds 220 pounds per square yard, the pavement will be constructed in two or more courses, unless otherwise specified on the Plans or as authorized by the Engineer.

E. The bituminous mixture will be placed by an approved self-propelled mechanical paver to such a depth that when compacted, it will have the thickness specified.

    1. The mixture will be dumped into the center of the hopper and care must be exercised to avoid overloading the paver and spilling the mixture upon the base.

    2. The paver speed will be adjusted at the discretion of the Engineer to that speed which, in his opinion, gives the best results for the type of paver being used and which coordinates satisfactorily with the rate of delivery of the mixture to the paver to provide a uniform rate of placing the mixture without intermittent operation of the paver.

F. When delays result in slowing paving operations such that the temperature of the mat immediately behind the screed falls below 170 degrees Fahrenheit, paving will be stopped and a transverse construction joint placed.

G. Bituminous mixture will be placed in one or more layers as called for on the Plans or as approved by the Engineer.

    1. To take out irregularities in the existing road surface, wedging with bituminous mixture will be done by placing several layers with the paver.

    2. Corrections to the foundation by wedging with bituminous material will be made by placing, compacting, and allowing the material to cool prior to paving.

H. Bituminous mixtures will be placed using two pavers in echelon or one paver equipped with an approved joint heater. Engineer may omit the use of the joint heater if the temperature of the previously placed mat does not fall below 170 degrees Fahrenheit prior to placement of the adjacent course.

    1. Echelon paving will be permitted when allowed by the Engineer.

I. Cold joints will be permitted along acceleration and deceleration lanes, lanes less than full width, irregularly shaped sections, and at transverse joints. The edges of the initial mat for cold joints will be painted with bituminous material before the bituminous mixture is placed in the adjacent section.

J. In placing the bituminous mixture adjacent to joints, hand raking or brooming will be required to provide a dense smooth connection.

K. Connections with existing surfaces at the beginning and end of resurfacing sections, and at intersections will be made by feathering out the mix, by constructing a butt joint, or as approved by the Engineer.

L. Placing the bituminous mixture will be in accordance with MDOT Section 501.

M. If the lanes are being constructed with two or more pavers in echelon, the loss depths of bituminous material from each paver will match at the longitudinal joints.

3.21 ROLLING AND COMPACTING OF BITUMINOUS MIXTURES

A. Each layer of bituminous mixture will be compacted with approved rollers. At least two rollers will be required when the mixture lay-down rate exceeds 800 square yards per hour.

1. Steel 3-wheel rollers may be used for initial compaction immediately following the paver.

B. The final rolling operation on each layer of bituminous mixture will be accomplished by use of tandem steel-wheel rollers or by use of vibratory rollers operated in the static mode.

1. Roller wheels will be kept properly moistened with water.

C. Pneumatic-tired rollers will be operated in a competent manner and will not mark or rut the surface or displace the pavement edges. The pneumatic-tired roller must be ballasted to obtain the required ground-contact pressures as directed by the Engineer.

1. To obtain a uniformly textured mat and the desired pavement density, the Engineer may recommend the Contractor to raise or lower tire pressures at any time during the rolling operations.

2. Roller operations will be conducted in such a manner as to prevent scuffing or chatter marks in the pavement surface.

3. The number of passes made by the pneumatic-tired roller will not be less than two round trip passes over each area.

D. Rolling of the mixture will begin as soon after placing without undue displacement, picking up the mat, or cracking. Rolling will start longitudinally at the extreme sides of the lanes and proceed toward the center of the pavement, overlapping on successive trips by at least half the width of the drive wheel of the roller.

1. Alternate trips of the roller must be of slightly different lengths.

2. Maximum roller speed must not exceed the manufacturer's recommended speed for the type of mixture or thickness of layer being placed.

E. When compacting an adjoining lane, the longitudinal joint will be rolled first with the roller supported mainly on the cold lane with only 3 to 6 inches of the roller extending onto the freshly placed bituminous material.

F. Finish rolling will continue until all roller marks are eliminated.

G. Pneumatic-tired rollers will not be permitted on wearing courses.

H. Areas too narrow to be rolled directly by standard 8 ton tandem rollers will be compacted by self-propelled trench rollers of suitable width, approved by the Engineer, and weighting not less than 300 pounds per inch of width.

I. Skin patching on an area that has been rolled will not be permitted. Any mixture that becomes mixed with foreign material or is in any way defective must be removed and replaced at the Contractor's expense.

3.22 WEATHER AND SEASONAL LIMITATIONS

A. Bituminous mixtures will not be placed, nor the prime coat or bond coat applied when rain is threatening or when the moisture on the existing surface would prevent satisfactory bonding.

B. Unless otherwise approved by the Engineer in writing, seasonal limitations for placing bituminous mixtures must be in accordance with the following:

1. Seasonal Limitations:

a. May 5 to November 15

C. Unless otherwise approved by the Engineer in writing, minimum mixture temperature limitations at the time of placement for placing bituminous mixtures must be in accordance with Table 2.

Table 2 - Mix Temperature Limitations

Temperature of Surface being Overlayed	Rate of Application of Bituminous Material		
	<120 lbs per syd	120-200 lbs per syd	>200 lbs per syd
35 to 39 degrees F			330 degrees F
40 to 49 degrees F		330 degrees F	315 degrees F
50 to 59 degrees F	330 degrees F	315 degrees F	300 degrees F
60 to 69 degrees F	315 degrees F	300 degrees F	285 degrees F
70 to 79 degrees F	300 degrees F	285 degrees F	270 degrees F
80 to 89 degrees F	285 degrees F	270 degrees F	270 degrees F
90 degrees F and over	270 degrees F	270 degrees F	270 degrees F
Bituminous paving will not be allowed when the mix temperature is below these minimum temperatures, nor when there is frost on the grade or existing surface.			

3.23 HEATING BITUMINOUS MATERIALS

A. Bituminous material which requires heating before application will be heated in such a manner as to ensure a uniform temperature throughout the entire mass with efficient and positive control at all times. It will be heated to a temperature consistent with the type of material used and only to such temperature as will ensure the necessary fluidity.

1. Excessively high temperatures must be avoided.

2. A thermometer must be provided to enable the Engineer to observe the temperature at any time.

3. Any bituminous material which has been overheated will be rejected and replaced at Contractor's expense.

B. Asphalt emulsion will be circulated continuously when heated above atmospheric temperature so as to prevent it from separating.

1. Heating of asphalt emulsion to the required temperature for application must be done entirely in the distributor unless a uniform temperature is maintained in the storage tank by means of a circulating heater.

2. Any asphalt emulsion which has been damaged by continuous heating for too long a time or by alternate heating and cooling will be rejected and replaced at Contractor's expense.

3.24 PATCHING

A. Where patching is required on a bituminous surface or concrete surface because of small holes or pitted surface, the holes will be cleaned of dirt and foreign material.

B. Bituminous patching material will be placed, struck off and compacted so that when completed, the patch will be flush with the adjacent pavement. Compaction may be done with a hand tamper, vibratory compactor or roller as approved by Engineer.

C. When patching is required for repairing a cut in the pavement, made for the construction of underground structures and utilities, the granular backfill will be compacted to not less than 95 percent of the maximum unit weight. An aggregate base material of not less than 12 inches compacted thickness, or a bituminous base of the specified thickness on the Plans, will be used. The top of the base will be 2 to 2-1/2 inches below the surface of the adjacent pavement. Bituminous patching material will be placed and compacted.

D. The surface of the bituminous patch will be smooth and not vary more than 1/4 inch from the crown and grade of the adjacent pavement. Variations over 1/4 inch from the established grade must be corrected by the Contractor, as determined by the Engineer.

3.25 CHIP SEAL

A. Seal coating will consist of one or more applications of bituminous material applied to the prepared surface and one or more coverings of coarse or fine aggregate applied to the bituminous material.

B. Asphalt emulsion must be CSEA or CRS-2M and aggregate will be MDOT 29A unless otherwise specified on the Plans.

C. Cover materials used for seal coating will be sufficiently dry when it comes in contact with bituminous material. Moisture content must not exceed three percent by weight on a dry basis. Satisfactory means will be provided by the Contractor for protection of the coating materials against excessive moisture by covering stockpiles, aeration or through approved manipulation.

D. Bituminous material specified for surface coat will be uniformly applied by means of the pressure distributor in the number of applications provided and in the amount per square yard as determined by the Engineer. Each application of bituminous material must cure sufficiently to prevent displacement or pickup by traffic or construction equipment before a succeeding application of bituminous material is made.

E. Following the application of surface coat bituminous material, the cover material must be uniformly spread over the surface by means of approved mechanical spreaders, in the amount per square yard specified or as determined by the Engineer. Truck wheels will ride on spread cover material and not on bituminous material.

F. Irregularities or deficiencies in the uniformity of the cover aggregate on the surface must be corrected by hand spreading and dragging.

G. Following the spreading of each course of cover material, the surface will be rolled by means of approved rollers.

H. Rolling will immediately follow the placing of cover material before the bituminous material has set. At no time will there be more than 300 feet of unrolled cover material. No cover material will be left unrolled for more than 5 minutes.

I. Sufficient rolling will be done to embed the cover material in the bituminous material without crushing the aggregate.

J. For areas deficient in cover material after completion of the surface treatment, additional cover material must be added. For areas with excessive cover material, the excess cover material must be removed before the next seal is applied. The final application of cover material will be swept with a power broom.

K. The completed surface will be maintained with a drag, broom or other approved equipment to keep the material well distributed on the road until all cover material possible has been embedded in the bituminous material. The length of time required for this maintenance will be from 2-5 days, as determined by the Engineer, depending on weather and materials used.

3.26 HOT MIX ASPHALT (HMA) CURB

A. HMA curb will be constructed to the design specified on the Plans or as approved by the Engineer and will include the conditioning and treating of the surface on which the curb is to be placed.

B. Materials used in the construction and installation of bituminous concrete curbing will meet the requirements as specified in this Section, as well as those specified in MDOT Section 904.

C. HMA curb mixture will be the same HMA mixture required to construct the leveling and top courses of pavement, unless otherwise approved by the Engineer.

D. HMA curb must be constructed to conform to the Plans or as determined by the Engineer. The method of construction must conform to MDOT Section 805, unless otherwise specified.

E. HMA must be thoroughly compacted by a curbing machine to the cross section shown on the Plans, or as determined by the Engineer. Curb will be formed to the density to produce a tight surface texture. Curbs showing segregation, slumping, or misalignment must be removed and replaced at the Contractor's expense.

F. When specified on the Plans or as directed by the Engineer, an application of asphalt emulsion or other approved bituminous coating will be applied to the finished curb at the joint of the curb and pavement, or to the inside face of the curb, or to both, as a protective seal.

G. Backfilling behind the curb will not commence until the HMA has cured.

H. Backfill material must be placed and thoroughly tamped and compacted to the satisfaction of the Engineer, without disturbing the curb, and will be left in a neat and smooth finished appearance.

3.27 BITUMINOUS APPROACHES, SIDEWALKS, AND SHOULDERS

A. This Work will consist of constructing a bituminous surface course as specified on the Plans, or as approved by the Engineer. The bituminous surface course will be placed on a prepared foundation.

B. Bituminous materials used will be as specified on the Plans, or as approved by the Engineer. Materials acceptable for use are specified in this Section and MDOT Section 904.

C. Bituminous approach mixture must be in accordance with MDOT Section 501, unless otherwise approved by the Engineer.

D. Existing pavement or aggregate base will be prepared to receive the bituminous surface course as specified in this Section.

E. Bituminous prime and bond coats used must meet the requirements specified in this Section. Care must be taken to prevent spreading of bituminous material on adjoining surfaces. When approved by the Engineer, the prime coat may be omitted.

F. Bituminous mixture will be placed to the thickness specified on the Plans or as determined by the Engineer.

G. Placing the bituminous mixture must conform to this Section.

H. When approved by the Engineer, the paver used for placing bituminous approaches and sidewalks will not be required to have an automatically controlled or activated screed or strike-off assembly or the corresponding grade referencing equipment. Also, with approval from the Engineer, only one roller may be used with each paver.

3.28 TENNIS COURTS

A. Bituminous tennis courts will be constructed to the cross section shown on the Plans, or as determined by the Engineer.

B. The materials used in the construction of the bituminous tennis court must meet the requirements specified in this Section and MDOT Section 904.

C. Bituminous base course mixture will be Marshall Mix MDOT 4C or 13A as specified in MDOT Special Provision 20-SP501X-xx and in accordance with MDOT Section 501, unless otherwise specified on the plans.

D. Bituminous surface course mixture will be Marshall Mix MDOT 4C, 13A or 36A as specified in MDOT Special Provision 20-SP501G-xx and in accordance with MDOT Section 501, unless otherwise specified on the plans.

E. Asphalt content and performance grade will be determined by the job mix formula submitted by the Contractor and approved by the Engineer.

F. The bituminous base course and wearing course will be constructed to conform to the Plan. The method of construction must conform to MDOT Section 501, unless otherwise specified.

G. The bituminous bond coat used must meet the requirements specified in this Section.

H. The rate of application must be 0.05-0.10 gallons per square yard.

I. For the preparation of the foundation to receive the bituminous base course and bituminous surface course see Part 3 of this Section.

J. The bituminous base course, if required, and the bituminous surface course will be installed to thickness shown on the Plans. The method of installation of mixtures must conform to this Section.

3.29 CLEANUP

A. The area adjacent to the new Work will be backfilled with sound earth of topsoil quality.

B. The backfill will be compacted, leveled and left in a neat, smooth condition. At a seasonally correct time the disturbed area will be raked, have topsoil placed thereon, fertilized and seeded per the requirements of Section 32 92 19 - Seeding, or sodded in accordance with Section 32 92 23 - Sodding.

3.30 MONUMENT BOXES

A. All government, plat, and street intersection monuments within existing or proposed pavement must be preserved by enclosing in standard monument boxes. Monument box castings must be furnished and installed by the Contractor and will be East Jordan Iron Works No. 1570 or approved equal.

B. Existing monument boxes will be adjusted to meet the proposed pavement elevation by removing the castings and resetting to the required elevation. Support for the monument box will be concrete bedding, so constructed as to hold them firmly in place. The adjacent pavement, curb, or curb and gutter will be replaced to the new elevation, condition, and kind of construction, unless otherwise provided.

3.31 TESTING

A. During the course of the Work, the Engineer may require testing for mix designs, aggregate gradation and physical properties, bitumen content, compaction or density, and thickness of material. The testing and coring required must be performed by a testing laboratory approved by the Engineer.

1. The cost for testing and coring will be at the expense of the Owner.

2. The testing laboratory will furnish the Engineer with two certified copies of the test results .

B. Testing procedures must conform to current MDOT Standards.

1. Testing of asphalt binders, liquid asphalts, asphalt emulsions, and tars must conform to MDOT Section 904.

C. Rolling will proceed until the required compaction is attained and the amount of rolling required will be based on the test results of a nuclear gage or on using a specified minimum number of rollers. When the total tonnage for the Project is in excess of 1,000 tons, the nuclear gage method will be used to govern the compaction requirements.

D. When the total tonnage for the Project is in excess of 1,000 tons, the nuclear gage method will be used to govern the compaction requirements.

1. The control density for the bituminous mixture to be placed, will be determined by use of a modified Marshall Test.

E. Control Density:

1. During the Contractor's start-up operations, a rolling procedure to attain the control density will be established.

a. The rolling procedure will be based on the number and type of rollers used and the rolling pattern.

b. The goal of the compaction effort will be to establish a rolling procedure which will achieve 100 percent of the control density but in any case, the density achieved must not be less than 95 percent of the control density.

c. Density values less than 98 percent will be sufficient cause for the Engineer to require an adjustment in the number or type of rollers being used or in the rolling pattern.

2. Once the procedure has been established on the start-up section, the procedure will be used for the remainder of the mixture to be placed, unless subsequent tests indicate a need to change the number of rollers or the rolling pattern.

3. If difficulties are encountered or if there is a significant change in aggregate or bitumen content, the Engineer will determine the control density for the new mixture and require the Contractor to again establish the number and type of rollers and the rolling pattern required on the new mixture to attain the control density.

a. Compaction procedures thus determined will be used when placing the remainder of that mixture.

4. Density checks will be made at the discretion of the Engineer to determine if the compaction procedure being used is achieving the required density, or if a change in procedure is necessary.

5. Each layer of bituminous mixture will be compacted to at least 95 percent of the control density, using the established procedure.

3.32 PRICE ADJUSTMENTS

A. Samples of asphalt binder may be taken prior to incorporation into the mixture and from the bituminous mixture. Where results of tests on these samples deviate from specification requirements, the affected material will be subject to price adjustments on the following basis:

1. When the test results deviate from the limits specified in MDOT Table 904-1, "Performance Graded Asphalt Binder Specification", by ten percent or more, the mixture produced will be evaluated by the Engineer and if in the Engineer's judgment the defective pavement warrants removal, the Contractor must remove and replace the affected area at the Contractor's expense.

a. If it is determined that the removal is not required, the Contract unit price of the affected mixture will be reduced by ten percent.

B. Core samples may be taken on the completed Work. If the results from testing of the core samples indicates a deficiency in the completed Work, the Engineer will evaluate the test results and will recommend removal and replacement or a credit to the Owner.

END OF SECTION

SECTION 32 13 13 - CONCRETE PAVING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes both plain and reinforced portland cement concrete paving complete with concrete material admixtures, joints, forms, equipment requirements, field quality control and appurtenances required to complete the portland cement concrete paving Work indicated on the Plans.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 50 00 - Temporary Facilities and Controls

C. Section 31 23 13 - Subgrade Preparation

D. Section 31 23 19 - Dewatering

E. Section 32 11 23 - Aggregate Base Courses

F. Section 32 17 23 - Pavement Markings

G. Section 32 92 19 - Seeding

H. Section 32 92 23 - Sodding

1.03 REFERENCE STANDARDS

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

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. Provide certification to the Engineer, upon request, that the various materials to be used conform to the standards referred to in the Specifications.

B. Submit a list of material supply sources for review prior to placing any order.

C. Provide the Engineer with the mix design, as required by ASTM C94/C94M, prior to the actual delivery of the ready-mixed concrete.

1.05 THICKNESS AND COMPRESSIVE STRENGTH REPORTS

A. Ensure the testing lab provides the Engineer with two (2) certified copies of the test results for the thickness and compressive strength of the concrete. Perform core drilling, testing for thickness and compressive strength, and certification of results through a testing laboratory approved by the Engineer.

1.06 WATER QUALITY TEST REPORTS

A. Ensure the testing lab provides the Engineer with two (2) certified copies of the test results for the quality of water to be used in the concrete. Conduct sampling and testing of water quality in accordance with AASHTO T 26 requirements, and have the certification of test results performed by a testing laboratory approved by the Engineer.

1.07 REQUEST FOR MATERIAL VARIANCE

A. Make all requests for variances in the materials, as specified, in writing to the Engineer.

B. Submit two (2) copies of the request for the Engineer's review and approval.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Comply with the requirements for concrete installation due to outside ambient air temperatures specified under Part 3 of this Section.

B. Comply with the requirements for protecting new Work against damage from rain, as specified under Part 3 of this Section.

C. Comply with the requirements for protecting new Work against damage from cold weather, as specified under Part 3 of this Section.

PART 2 PRODUCTS

2.01 CEMENT

A. Use low alkali, air-entraining Portland cement conforming to ASTM C150/C150M, Type IA or Type IIIA.

2.02 FINE AGGREGATES

A. Ensure the fine aggregate gradation conforms to ASTM C33/C33M and to fine aggregate, 2NS, as specified in MDOT, Section 902.08.

2.03 COARSE AGGREGATE

A. Ensure the coarse aggregate gradation conforms to ASTM C33/C33M and to coarse aggregate, 6A, or 6AA as specified in MDOT, Section 902.03.

2.04 WATER

A. Use water for mixing and curing concrete that is reasonably clean and free from oil, salt, acid, alkali, sugar, vegetable matter, or other substances injurious to the finished product.

B. Waters from sources approved by the Michigan Department of Public Health as potable may be used without testing.

C. Test water requiring testing in accordance with the current Method of Test for Quality of Water to be Used in Concrete, AASHTO T-26, and as specified in MDOT, Section 911.

2.05 CONCRETE ADMIXTURES

A. Air-Entraining Admixtures

1. Use air-entraining admixtures for concrete that conform to ASTM C260/C260M and as specified in MDOT, Section 903.01.

B. Concrete Accelerators

1. Use chemical admixtures, other than calcium chloride, for accelerating the set of Portland cement concrete that conform to ASTM C494/C494M, Type C or Type E.

2. Use calcium chloride in flake or pellet form that conforms to ASTM D98, Type S, Grade 1 or grade 2, flake or pellet form, and as specified in MDOT, Section 903.04.

3. Use calcium chloride in solution form that conforms to MDOT, Section 903.04.

C. Water-Reducing and Water-Reducing Retarding Admixtures

1. Use water-reducing admixtures and water-reducing retarding admixtures that conform to ASTM C494/C494M, Type A or Type D, without containing calcium chloride, and as specified in MDOT, Section 903.02.

D. Pozzolanic Admixtures

1. Use Fly Ash that conforms to ASTM C618, Type F, and as specified in MDOT, Section 901.07.

2. Use ground granulated blast furnace slag that conforms to ASTM C989/C989M, Grade 100, minimum.

2.06 CONCRETE CURING COMPOUNDS

A. Use white membrane curing compound for curing concrete that conforms to ASTM C309, Type 2, Class B Vehicle, and as specified in MDOT, Section 903.06.

B. Use transparent membrane curing compound for curing base course concrete that conforms to ASTM C309, Type 1-D, Class B Vehicle, and as specified in MDOT, Section 903.06.

2.07 LANE TIE BARS

A. Use bar reinforcement for pavement tie bars that conforms to ASTM A706/A706M, or ASTM A615/A615M, Grade 60, and as specified in MDOT, Section 914.09.

2.08 STEEL WELDED WIRE FABRIC

A. Use welded steel wire fabric for concrete mesh reinforcement that conforms to ASTM A1064/A1064M, and as specified in MDOT Section 905.06. Fabricate the mesh as shown on the Plans.

2.09 DOWEL BARS

A. Use dowel bars and basket assemblies for transverse expansion and contraction joints that conform to ASTM A615/A615M Grade 40 and MDOT Section 914.07.

2.10 STEEL HOOK BOLTS

A. Use hook bolts that conform to ASTM A706/A706M, Grade 60 of ASTM A615/A615M, or ASTM A996/A996M., with a diameter of 5/8 inch. Use expansion anchored hook bolts along the edge of existing concrete.

2.11 JOINT FILLERS

A. Use fiber joint filler material for expansion joints that conforms to ASTM D1751, and as specified in MDOT, Section 914.03.

B. Use bituminous premolded joint filler material that conforms to ASTM D994/D994M and AASHTO M 33M.

C. Use polyethylene premolded joint filler for pressure relief joints made from a flexible, low-density, expanded, extruded polyethylene plank. Form the plank by expanding polyethylene base resin through an extrusion process, ensuring it is homogeneous, closed-cell, and multi-cellular.

2.12 JOINT SEALANTS

A. Use hot-poured type joint sealant that conforms to AASHTO M324 or ASTM D6690 Type II and as specified in MDOT, Section 914.04.

B. Use cold-applied, single component type joint sealant that conforms to ASTM D5893.

2.13 CONCRETE MIX

A. Ensure concrete yields a minimum compressive strength of 3500 PSI when cured in a moist room at a temperature between 65 to 75 degrees F for a period of 28 days.

B. Use a nominal 564 lbs/cyd mix with a minimum of 25% Type F Fly Ash. Provide documentation from actual project mixes showing 28-day compressive strength of at least 3500 PSI when tested under field conditions.

1. Use water reducers, additional fly ash, ground granulated blast furnace slag (GGBFS), and other pozzolans only when approved by the Engineer. Limit fly ash quantity to a maximum of 40%; maintain GGBFS quantity between 25% and 40%.

2. Limit total cement replacement to a maximum of 40%. Replace cement with GGBFS and Fly Ash on a pound-for-pound basis.

C. Use air-entraining Portland cement ASTM C150/C150M, Type IA. Use Type IIIA when high-early strength concrete is required.

D. Use high early strength concrete with 4500 PSI, 658 lbs/cyd, and a water reducer. Maintain a water-cement ratio between 0.38 and 0.39.

E. Adjust the air content of the concrete based on the maximum size aggregate as follows:

Maximum Size of Aggregate	**Air by Volume (%)**
1-1/2 to 2-1/2 inch	5
3/4 to 1 inch	6
3/8 to 1/2 inch	7-1/2

F. Maintain the slump of the concrete between 1-1/2 to 2-1/2 inchwhen using machine methods for striking off and consolidating. Increase the slump to 3-1/2 inch if hand finishing is permitted by the Engineer

G. Produce ready-mixed concrete in accordance with ASTM C94/C94M, Alternate 2, with a minimum compressive strength of 3500 PSI when cured in a moist room at a temperature within a range of 65 to 75 degrees F for a period of 28 days.

H. Provide the Engineer with the mix design for review and approval prior to the actual delivery of the concrete.

PART 3 EXECUTION

3.01 VERIFICATION OF EXCAVATION AND FORMING

A. Prior to the installation of any concrete, examine the excavation and forms for the grades, lines, and levels required to receive the new Work. Ascertain that 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. Obtain an adequate site for the batch plant at the Contractor’s expense. Maintain the site and operate the plant in accordance with the conditions and requirements established by the local community.

3.05 FINE GRADING

A. Fine grade the subgrade to the cross section shown on the Plans and thoroughly compact it prior to placing forms or concrete.

3.06 INSTALLATION - GENERAL

A. Construct the concrete pavement to the width, thickness, and type specified on the Plans or as approved by the Engineer.

B. Provide curb drops at street intersections for the construction of sidewalk ramps, conforming to the current rules and regulations of Act 8, Michigan PA 1973.

C. Provide curb drops for sidewalk ramps and driveway approaches at locations specified on the Plans or as approved by the Engineer.

D. Restrict construction operations to the existing right-of-way. If additional area is needed, furnish the Engineer with written permission from the property owner for any operation conducted outside the established right-of-way.

E. Maintain traffic access at all intersections. Ensure vehicle access to all commercial and public properties, and other locations as designated by the Engineer.

3.07 FORMS

A. Except when paving with a slip-form paver, use forms made of metal with an approved section that provides rigidity under impact, thrust, and the weight of the heaviest machine carried on them. Use metal with a minimum thickness of 1/4 inch, or 3/16 inch if the form has a trapezoidal cross section.

B. Use forms with a minimum length of ten 10 feet and a depth not less than the prescribed edge thickness of the Work. Allow the subgrade to be a maximum of 1 inch lower than the bottom of the forms only when approved by the Engineer. Ensure the base width in direct bearing on the soil is at least 0.75 of the form depth, with a minimum base width of 8 inches.

C. Provide at least three (3) stake pockets for each 10 feet section of form. Keep the forms straight and free from distortion. Ensure no vertical variation exceeds 1/8 inch in 10 feet lengths from the true plane surface on the top of the form when tested with a 10 feet straightedge. Maintain no lateral variation greater than 1/4 inch from the true plane surface on the vertical face of the form when tested with a straightedge.

D. Approved wood or flexible forms and hand finishing will be required on all pavement where the radius for the edge of the pavement is less than 200 feet.

E. Use a connection method between form sections that forms a locked joint. Prevent vertical movement exceeding 1/8 inch and horizontal movement exceeding 1/4 inch under the impact, thrust and weight of the heaviest machine carried on the forms.

F. Provide sufficient forms to avoid removing them in less than 12 hours after placing the concrete, or longer if required.

3.08 EQUIPMENT REQUIREMENTS

A. Use approved mechanical concrete placing and finishing equipment for concrete paving, except in gapped areas or where the Engineer approves otherwise.

B. Furnish sufficient equipment for placing concrete pavement. Keep the equipment on the job site and ready for normal operation before starting the paving operation. Maintain all equipment in good working order. Subject the equipment to inspections and testing during construction.

C. Use equipment with sufficient capacity to allow the paver to operate continuously, achieve a production rate that ensures good workmanship, and eliminate equipment overloading or frequent interruptions and delays.

D. Equip equipment operating on or near the pavement with rubber-tired wheels.

E. Subgrade Roller or Compactor:

1. Use self-propelled steel-wheeled or pneumatic-tired rollers weighing not less than 8 tons, or self-propelled vibratory compactors of adequate size to compact the subgrade to the required density.

F. Subgrade Planer:

1. A steel-shod subgrade planer supported by two (2) flanged wheels resting on the side forms may be used for trimming the subgrade in small areas when approved by the Engineer.

2. Adjust the steel-shod template to fit the shape of the pavement bottom. Connect it adequately to a rigid frame to maintain the crown.

3. Use a planer with sufficient weight to plane off all high spots encountered.

G. Base Trimmer:

1. Use a powered, self-propelled base trimmer for slip-form construction. Ensure the base trimmer can trim the base to the required cross section.

H. Water Supply Equipment:

1. Use pumps and pipe lines with sufficient capacity and nature to ensure an ample supply and adequate pressure of water simultaneously for all machinery, mixing, sprinkling subgrade, and other Work requirements.

2. Water may be supplied in tank wagons to augment inadequate pipe lines or to replace them entirely if a sufficient number of units are employed.

I. Finishing Machine:

1. Use a power-driven finishing machine of an approved type that strikes off and compacts the concrete with screeding and troweling action. Ensure the machine can finish the concrete as specified and provide a minimum of two (2) oscillating screeds.

2. A combination concrete spreader/finishing machine (i.e., Pav-Saver®) may be used for residential streets not exceeding 100 feet in length and 18 feet in width or when approved by 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. Use an approved concrete spreader with a strike-off board or a separate strike-off to level each layer of concrete before placing reinforcement and before finishing the concrete.

a. Ensure the equipment has sufficient weight and rigidity to retain its shape under working conditions and properly strike off the concrete.

b. Two separate spreaders are not required where an approved mesh depressor type machine is used.

2. A concrete spreader is not required for the construction of residential street concrete pavement when approved by the Engineer.

K. Vibratory Screed:

1. Provide an approved hand-propelled vibratory screed for use in gapped areas at driveways and intersections, and where machine methods cannot feasibly screed and consolidate the concrete.

    a. Limit gaps finished by this method to one (1) joint spacing in length and one (1) single lane width.

2. Construct the screed with a steel-shod strike board at least two 2 inches thick, equipped with a gasoline engine capable of producing at least 5,000 vibrations per minute.

3. Other vibratory screeds may be approved by 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. Ensure the equipment provides adequate stirring of the compound during application.

M. Slip-Form Paving Equipment:

1. When pavement is placed by the slip-form method, operate slip-form paving equipment to spread, consolidate, screed, and mechanically float freshly-placed concrete, minimizing hand finishing needed to produce a dense and homogeneous pavement.

2. Equip the machine to vibrate the concrete across the full width and depth of the pavement being placed.

N. Floats:

1. Use a combination float finisher as the mechanical float. Omit a separate mechanical float when a mechanical float forms an integral part of a slip-form paver.

2. Construct a float finisher as a machine with two (2) screeds and equip it with a suspended pan float. Suspend the second screed and pan float so they operate independently of the side forms.

3. A mechanical float will not be required for the construction of residential street concrete pavement.

O. Footbridge:

1. Provide a movable bridge when necessary to finish the pavement or construct joints satisfactorily. Design and construct the bridge to avoid contact with the concrete.

P. Transverse Float:

1. Make this float of metal, at least 10 feet in length, and of the box or channel type with a floating face at least 6 inches wide. Construct it to be light in weight, rigid, and free from warps.

Q. Vibrator:

1. Use an approved internal electric or mechanical vibrator, at least 2 inches in diameter, to consolidate concrete along the faces of the forms and adjacent to joints. Maintain a minimum frequency of 5,000 vibrations per minute for a tube 2 inches in diameter, 3,600

vibrations per minute for a tube 4 inches in diameter, or a proportionate frequency for an intermediate size.

2. Provide at least two (2) vibrators for each concrete paving unit on the project.

3. Connect vibrators used adjacent to the forms in conventional paving to the equipment on which they are mounted. Start concrete vibration automatically with the equipment's forward movement and stop it automatically whenever forward movement ceases.

R. Form Tamper:

1. Use a mechanical form tamper of approved design on all projects. Ensure it thoroughly and uniformly compacts the soil under the forms.

S. Strike-Off for Reinforcement:

1. Use an approved strike-off to level the concrete before placing pavement reinforcement. Adjust it and support it with two (2) flanged wheels on each end resting on the side forms.

2. Ensure it has sufficient weight and rigidity to retain its shape under working conditions and properly strike off the concrete.

3. Use an approved hand strike-off resting on the forms for irregular areas.

4. The strike-off may be a part of the concrete spreader or a finishing machine.

T. Lane Tie Bar Installer:

1. Install lane tie bars with an approved mechanical device when not placed on approved chairs.

U. Reinforcement Carrier:

1. Transfer reinforcement not placed on chairs from hauling equipment to a movable bridge spanning the pavement being cast or place it by other approved means that avoid contaminating the concrete.

2. Design the bridge to carry the reinforcement load without appreciably deflecting the forms.

V. Joint Filling and Sealing Equipment:

1. Make equipment for filling and sealing joints available for inspection and testing at least 48 hours before use.

2. Include a mechanical mixer in the sealing machine to mix sealing components into a uniform, homogeneous mass.

3. Use a heating kettle for hot poured sealing material of the indirect-heating or double boiler type, employing oil as the heat transfer medium.

a. Equip the heating kettle with a thermostatically controlled heat source, a built-in automatic agitator, and thermometers indicating the temperatures of both the melted sealing material and the oil bath.

b. Demonstrate that the proposed equipment consistently produces a joint sealer of proper pouring consistency.

4. Apply the hot-poured sealing material directly from the heating kettle. Equip the kettle with a pressure pump, hose, and nozzle suitable for forcing sealing material to the bottom of the joint and completely filling the joint.

    a. Control the application rate to completely fill the joint without spilling material on the pavement surface.

    b. Maintain the temperature of sealing materials in the hose and nozzle, ensuring temperature loss does not exceed 10 degrees F between the nozzle and the heating tank.

    c. Do not use direct flame heat on the nozzle to maintain the proper temperature of the sealing material.

    d. Mount the heating equipment on rubber-tired wheels. Use only rubber-tired equipment to move the heating equipment on the pavement.

5. Apply cold applied sealing compound using pressure equipment that forces the material to the bottom of the joint and completely fills the joint without overflowing onto the pavement surface.

W. Preformed Neoprene Joint Sealing Equipment:

1. Equipment for applying the lubricant and installing the preformed joint seal may be either power or hand operated equipment suitable for installing the joint seal as recommended by the manufacturer.

X. Sandblasting Equipment or Power Wire Brush:

1. Use sandblasting equipment of proper size and capacity to achieve the specified cleaning. Operate it at a nozzle pressure adequate for the performance of the Work.

2. Use nozzles with a diameter appropriate for the width of the joint. Replace them as necessary when enlarged by wear.

3. A power wire brush may be used in place of sandblasting equipment.

Y. Air Compressors:

1. Use portable air compressors capable of supplying sufficient air to maintain nozzle pressure adequate to remove all loose concrete fragments and foreign material from the joints.

2. Employ suitable traps to keep the compressed air free of oil and moisture.

Z. Power Broom:

1. A mechanical broom with pickup suitable for cleaning the pavement will be required.

AA. Concrete Saw:

1. Provide two (2) self-propelled concrete saws adequately powered to cut hardened concrete to the minimum depth shown on the Plans. Use saw blades with a minimum thickness of 3/16 inch.

2. Equip saws with suitable guards.

BB. Miscellaneous Equipment:

1. Provide all other small tools necessary to completely and satisfactorily finish the Work, including straightedges for testing pavement and forms.

3.09 PLACEMENT OF FORMS

A. Place and check forms for line and grade at least 500 feet in advance of placing concrete.

B. Stake and brace forms adequately to resist the pressure of concrete and the thrust of the equipment.

C. Ensure forms have uniform bearing on the subgrade throughout their entire length and width.

D. After setting the forms to grade, thoroughly tamp both the inside and outside with an approved mechanical form tamper.

E. Thoroughly clean forms before placing them.

F. Join forms neatly and tightly. Secure them with at least three (3) stakes per form.

G. Oil forms before placing concrete against them.

H. Check forms for line and grade after setting them.

I. Adjust forms showing a variance from the staked line exceeding 1/4 inch or from the staked grade exceeding 1/8 inch in 10 feet.

J. Provide sufficient back bracing when using flexible forms to prevent undue deflection during concrete placement.

3.10 PLACING CONCRETE

A. Placing of concrete should not commence or continue until the condition of the subgrade has been approved by the Engineer.

B. Spread or distribute concrete immediately after placing. If not using a mechanical spreader, deposit concrete to minimize re-handling and avoid segregation and separation of materials. Deposit concrete to a height sufficiently above grade so that consolidation and finishing achieve the required finished grades.

C. Consolidate and compact concrete along the faces of forms and adjacent to joints to fill all voids.

D. Do not vibrate forms to consolidate the concrete.

E. When the pavement is placed in two (2) layers, the first layer may be cast 3 to 6 inches narrower on each side than the proposed pavement slab, so that the full depth of pavement, at the edges, will be cast with the second layer.

F. Vibrate concrete placed full depth across the complete width and depth of the pavement being placed. Vibrate only the second layer for concrete placed in two (2) layers.

G. Place concrete continuously as much as possible between transverse joints.

H. Cover concrete and the unfinished slab end with wet burlap or plastic whenever a temporary halt in operation occurs.

I. Place a construction joint if the Work interruption continues more than 20 minutes, provided the proposed joint is 15 feet or more from the last joint for reinforced pavement and at least 10 feet or more from the last joint in plain concrete pavement.

1. Do not permit sections of pavement shorter in length; remove and replace any constructed sections at the Contractor's expense.

J. Construct integral curbs monolithic with the pavement slab where specified or required. Place the curb material before the pavement begins its initial set, using the same mix as the concrete pavement.

K. Use base and back forms when constructing straight curbs. Use back forms with templates of the required curb shape when constructing rolled and mountable curbs. Spade curb concrete sufficiently to eliminate all voids and tamp to bring mortar to the surface. Give the curb a final finish to match the pavement texture.

L. Fill any visible honeycomb or minor defects immediately after removing forms with mortar made of one part Portland cement and two parts fine aggregate. Apply the mortar with a wooden float.

M. Do not operate equipment on recently placed concrete in adjacent pavement lanes constructed in separate pours until the pavement attains at least 85% of design strength from testing cores or reaches 14 days old, as determined by the Engineer.

N. Operate any equipment wheels on the pavement at least 1 foot from the pavement edge. Use rubber-tired equipment wheels.

O. Do not permit the paver on the new slab until the pavement attains full design strength. Prevent the paver from operating on any new slab without using wood mats of approved thickness and width to avoid marking or structural damage.

P. Pavers are not permitted to operate on residential streets.

Q. Repair damaged curing compound by spraying additional curing compound on damaged areas as soon as the Work is completed.

R. Pour the filler strip on pavement widening projects as soon as possible, but no later than the first working day after placing the slab.

S. Complete construction at all intersections and where property access is required by gapping the proposed pavement. Place load transfer, contraction, or end-of-pour joint devices at the gapped pavement ends.

T. In lieu of pavement gapping, the Contractor may elect to place a temporary bridge, of a design approved by the Engineer, to provide access. Furnish, place, maintain, and remove the bridge at the Contractor's expense.

3.11 PLACING PAVEMENT REINFORCING

A. Place reinforcement sheets or mats at the depth below the finished pavement surface shown on the Plans.

B. Ship and deliver pavement reinforcement to the Work in flat sheets or mats.

C. Lap adjacent sheets or mats as indicated on the Plans, fastening them to each other in no fewer than two (2) places in each pavement lane.

D. Maintain reinforcement requirements as called for on the Plans where pavement width varies. Use split sheets or mats to conform to the specific pavement configuration. Ensure side laps are not less than the spacing of longitudinal wires or bars.

E. Substitute 1/2 inch diameter longitudinal reinforcing bars for standard reinforcement on widening Projects where the pavement slab is less than 6 feet wide. Space bars no more than 12 inches center-to-center. Place the first bar no more than 3 inches from the edges of the widened slab and lap bars a minimum of 12 inches.

F. Install reinforcement using one of the following methods:

1. Use chairs that support the reinforcement and provide sufficient bearing on the base to prevent undue penetration. Space chairs to maintain reinforcement at the specified depth. Place reinforcement directly from the hauling unit onto the chairs.

2. Mechanically spread and strike off the first concrete layer to the required depth below the proposed finished surface when placing reinforcement between two (2) layers of concrete. Place reinforcement directly from the carrier onto the struck-off concrete.

3. Mount reinforcement on chairs in any area where using the mechanical spreader or mechanical strike-off is not feasible.

3.12 JOINTS

A. Construct all longitudinal and transverse joints to conform to the details and at locations shown on the Plans or as directed by the Engineer.

B. Construct all joints true to line with faces perpendicular to the pavement surface.

C. Construct transverse joints at right angles to the pavement centerline, unless otherwise specified on the Plans or determined by the Engineer. Limit joint variation to no more than 1/4 inch from a true line.

D. Finish the pavement surface adjacent to all joints to a true surface. Edge joints to the radius shown on the Plans or a minimum 1/4 inch radius where indicated. Test the surface across joints with a 10 foot straightedge as joints are finished, and correct any irregularities before the concrete hardens.

E. Place transverse joints in succeeding partial-width slabs in line with the corresponding joints of the first slab. For widening existing pavements, place transverse joints as shown on the Plans or as directed by the Engineer.

F. Form keyways accurately using templates of metal, wood, or paper securely pinned in place. Ensure the gauge or thickness of template material forms the full keyway as specified and in the correct location.

G. Longitudinal Joints:

1. Construct longitudinal joints as longitudinal lane tie joints with tie bars or bulkhead construction joints with hook bolts. Build a keyway in the bulkhead construction joint where called for on the Plans.

a. Longitudinal Lane Tie Joint (D):

1) Form longitudinal lane tie joints with tie bars as planes of weakness by sawing a groove in hardened concrete according to the alignment, width, and depth shown on the Plans.

2) Place tie bars of the specified type, diameter, and length at the required depth parallel to the finished surface, at right angles to the joint, and at the uniform spacing called for on the Plans or as approved by the Engineer.

3) Use bar chairs to support the lane tie bars or install the lane tie bars with a mechanical device approved by the Engineer. Do not place lane tie bars in the concrete by hand methods.

4) Saw the joint as soon as the concrete will not spall or within three (3) days after placement, and complete the sawing before any traffic uses the pavement. Immediately after sawing the joint, remove the slurry completely from the joint and surrounding area by flushing with a jet of water under pressure.

5) Blow out the joint with a jet of compressed air to remove the flushing water.

(a) After the joint dries, clean it out with a jet of compressed air at a working pressure of at least 90 psi, then seal it in accordance with these specifications using an approved hot or cold applied type joint sealing compound.

(b) Apply the sealing compound with approved pressure type equipment, extending the nozzle into the groove, and fill the groove until the sealer overlaps the pavement about 1/8 inch.

b. Longitudinal Bulkhead Construction Joint (D):

1) Use longitudinal bulkhead construction joints with hook bolts in part-width concrete pavement construction and other locations shown on the Plans or as approved by the Engineer. Follow the size, spacing, and depth of the hook bolts below the pavement surface as shown on the Plans.

2) Substitute lane ties of an approved type for hook bolts in slip-form paving and space them at 30 inch centers, unless otherwise indicated on the Plans.

(a) Place lane ties for slip-form paving in the concrete using a pneumatic powered installer or equipment producing equal results.

(b) Replace lane ties that are not set with adequate concrete consolidation or are not within 30 degrees of perpendicular to the pavement edge in a horizontal plane with drilled-in expansion-anchored lane ties.

3) Attach hook bolts and couplings to the forms when constructing a bulkhead joint and hold them in position during concrete placing and finishing to allow removal of the pavement forms without damaging the concrete or hook bolt assembly. Protect the ends of the couplings to prevent concrete, dirt, or other materials from entering and obstructing a satisfactory connection with either hook bolt.

4) Insert rust preventive oil into the open end of the couplings immediately after removing the pavement forms where hook bolts or lane ties are installed for future

pavement widening, curb, or curb and gutter construction, using a hand-operated pump to apply enough oil to completely cover the internal threads.

(a) After applying the protective oil, insert neoprene or plastic plugs into the ends of the couplings to completely seal the opening without protruding more than 3/8 inch outside the couplings.

5) Edge the concrete with a tool matching the radius of curvature and depth of lip shown on the Plans. Use a longer lipped edging tool for the second concrete pour than the one used for the first pour.

6) After the concrete cures for the required time, remove all extraneous material from the joint and then seal the joint with an approved hot-poured or cold-applied elastic-type compound. Clean the joint before sealing using sandblasters and a jet of compressed air.

H. Transverse Joints:

1. Design transverse joints as contraction joints, plane of weakness joints, dummy joints, expansion joints, construction joints, end-of-pour joints, and pressure relief joints.

a. Contraction Joints (C):

1) Construct contraction joints with a load transfer unit and a joint groove formed by sawing. Build contraction joints as indicated on the Plans and space them at a maximum of every 57' - 3" or as otherwise provided.

2) Use epoxy-coated dowel bars as the load transfer unit, spacing and arranging them according to the positions indicated on the Plans. Hold them accurately in place with an approved metal device to keep them perpendicular to the pavement cross-section plane and parallel to the centerline, at a depth from the surface equal to 1/2 the slab thickness.

3) Use a device consisting of connected transverse and longitudinal members arranged to hold each dowel firmly so that its final position after concreting does not vary more than 1/8 inch per foot of length from the designated line and grade. Design the device to allow complete assembly of the joint alongside the Work and to be sufficiently rigid to lift the joint into place on the subgrade as a unit.

4) Allow one end of each dowel bar to move freely in the slab as the concrete contracts and expands.

(a) Lubricate 2/3 of each dowel’s length thoroughly with liquid asphalt to allow movement. Apply the liquid asphalt coating to a sawed end of the dowel bar or, for dowel bars with sheared ends, place a metal cap on the coated end.

(b) Allow the asphalt coating to dry sufficiently before using the dowels to prevent removal during handling and placement in the joint.

(c) Install the bars so that the coated end alternates on each side of the joint.

b. Plane of Weakness Joints (WT):

1) Place Plane of Weakness joints only in plain concrete pavements immediately after finishing operations. Form a groove in the plastic concrete with a metal forming bar to the depth indicated on the Plans.

2) Place a premolded bituminous filler strip in the groove formed by the metal bar using a bridge operating on the pavement forms.

3) Float the concrete against the sides of the filler, then edge the joint to a 1/8 inch radius.

c. Plane of Weakness Joint for Concrete Base Course (WTB):

1) Place dummy joints in reinforced concrete pavements only where called for on the Plans.

2) Construct dummy joints immediately after finishing operations by forming a groove in the plastic concrete with a metal forming strip and placing expanded polystyrene or another approved temporary filler into the groove.

3) Install the material flush with the pavement surface and finish the area on both sides of the joint. Do not edge transverse joints with a temporary filler.

4) Continue the pavement reinforcement through this joint.

d. Expansion Joints (E) and (E1):

1) Construct expansion joints (E1) with a load transfer unit and a premolded fiber filler and use them on reinforced concrete pavements or where shown on the Plans.

2) Construct expansion joints (E) with a premolded fiber filler without the load transfer unit and use them for joints in concrete capping, end connections with structures or existing pavements, plain concrete pavements, and other locations shown on the Plans or where installing the load transfer unit is not feasible, as approved by the Engineer.

3) Assemble the load transfer units and lubricate the epoxy-coated bars with liquid asphalt. Provide a close-fitting metal cap on the liquid-asphalt-coated end of each bar.

4) Extend the fiber filler the full depth and width of the joint.

(a) After installation, position the top at no less than 1/2 inch and no more than 1 inch below the finished surface.

(b) Furnish the units in lengths not less than the lane widths being poured. Provide additional partial lengths with a minimum length of load transfer unit and premolded fiber filler sufficient to span two (2) dowel bar spacings.

(c) Securely join sections together when more than one (1) section is allowed and used in a joint.

5) Extend the fiber filler used in the pavement completely through the curb section for expansion joints in curb lanes with integral curb or separate curb and gutter. Place the fiber filler above the slab in the curb at 1 inch in width.

6) Hold the joint in place during installation with an approved installing device securely staked.

(a) Protect the top edge of the filler during concrete placement with a metal channel cap of at least 10-gage material, having flanges not less than 1-1/2 inches in depth.

(b) Shape the channel cap to the proposed crown of the pavement and extend it over the full length of the filler.

e. Pressure Relief Joints (PR):

1) Construct the pressure relief joint using the method indicated on the Plans.

2) Use a flexible, low-density, expanded, extruded polyethylene plank as the pressure relief joint material. Cut the joint material off to 1/2 inch below the top of the pavement surface, and extend it entirely through and to within 1/2 inch of the face and top of the curb.

f. End of Pour Joints and Construction Joints:

1) Form end of pour joints in reinforced pavement by placing a bulkhead and installing a load transfer device, as specified for contraction joints, except do not lubricate the ends of the dowel bars. Install the load transfer device so that each dowel bar is embedded in the concrete for 1/2 of its length.

2) Provide a space for hot-poured rubber joint filler during the next pour by placing a temporary filler in the fresh concrete.

3) Construct end-of-pour joints using 2-piece dowels and a bulkhead, and place them where a delay of three (3) days or more is anticipated between the casting of adjacent pours.

4) Seal construction joints and end-of-pour joints as specified for transverse contraction joints.

5) Form end-of-pour joints in plain concrete pavements by placing a bulkhead, fiber keyway, and installing 1/2 inch diameter deformed bars, 30 inches in length, at 18 inch intervals across the end of the pavement.

6) Thicken the pavement across the end of both slabs, and edge and seal the joint.

2. Extend all transverse joints in concrete pavement entirely through the integral curb or separate curb and gutter. Use the same kind of material to construct the joint in the curb as provided for the pavement.

3. Use bituminous fiber filler to construct expansion joints in the integral curb of reinforced concrete pavements.

a. Set the thickness of the fiber filler material in the curb above the gutter to 1 inch.

b. Precut the joint material to conform to the geometric shape and cross-sectional area of the curb, and place it in intimate contact with the filler material in the pavement.

I. Round the edges of all transverse joints in the integral curb with an approved finishing tool, having a radius of 1/4 inch.

3.13 CONSOLIDATING AND FINISHING

A. Follow this sequence of operations after placing the concrete:

1. Striking off and consolidating
2. Floating
3. Edging
4. Final finishing with burlap drag

B. Employ mechanical methods to strike off and consolidate or compact the concrete, except in gapped areas or where the pavement width prevents machine methods. Finish gaps less than one (joint opening in length by hand methods, ensuring they are finished in single-lane widths.

C. Strike off, consolidate and compact the concrete to such an elevation that when all finishing operations are completed, the surface will conform to the required finished grade and cross section.

1. Maintain at least 4 inches of concrete above the finished pavement grade ahead of the screed for its entire length.
2. Operate a single screed finishing machine twice over each section of the pavement when consolidating the surface on residential street construction.
3. Work only sufficient mortar to the surface to provide a dense, smooth finish.
4. Do not operate the machine excessively over a given area. Thoroughly mix segregated particles of coarse aggregate collected in front of the screed by hand with the mass of concrete already on the subgrade.

D. Use an approved, self-propelled vibratory screed to strike off and properly consolidate the concrete surface to the required finish grade when mechanical equipment cannot be used on irregular areas.

1. Consolidate the entire area of the pavement to ensure an absence of voids.
2. Where it is not possible to use a vibratory screed, a hand strike board of an approved design, will be permitted.

a. Move strike-off boards forward with a combined longitudinal and transverse motion, keeping both ends in contact with the side forms during the process.

b. Keep a slight amount of excess concrete in front of the front edge at all times.

c. When striking off and consolidating by hand, pours will be limited to single lanes or 1/4 of intersections.

E. Make the surface uniform by longitudinal or transverse floating using a mechanical method after striking off and consolidating, unless constructing the pavement in single lane widths is permitted.

F. Where mechanical floating is an integral part of the operation of a slip-form paver, separate mechanical floating methods will not be required.

G. Mechanical longitudinal floating will not be required for residential street construction.

H. Operate a transverse float at least 10 feet in length across the pavement by starting at the edge, slowly moving to the center, and back to the edge when mechanical equipment is not used for floating. Then move the float ahead 1/2 of its length and repeat the operation.

I. Preserve the crown and cross section of the pavement carefully.

J. Do not proceed with the float finishing operation until the concrete attains a consistency that prevents excess concrete from being carried ahead of the float, yet allows the entire surface to be floated and sealed.

K. Immediately after float finishes and while the concrete remains plastic, test the slab surface for trueness using a 10 foot straightedge or acceptable float.

1. Place the straightedge at the center of the slab with the blade parallel to the centerline, and pull it slowly and uniformly to the edge. Repeat this operation until the concrete surface is free from irregularities and makes contact at all points with the bottom of the straightedge. Then move the straightedge forward half its length and repeat the operations.

2. Fill depressions found in the surface with fresh concrete and consolidate them by floating with a long-handled float not less than 10 foot in length. Use this float also to smooth sections of the surface that have become rough or torn by dragging with the straightedge.

L. Determine edge settlement for pavement constructed by the slip-form method as soon as practical after paving operations begin. Correct edge settlement exceeding 3/8 inch before the concrete hardens.

1. Suspend paving and make operational corrections when edge settlements exceed 1/4 inch before the Engineer permits resumption of paving. Discontinue slip-form methods and place pavement using conventional forms if the Contractor consistently fails to construct pavement within these tolerances.

2. Wipe all mortar paste from the sides of the slab when paving is accomplished by the slip-form paving method.

3. Test the surface for smoothness with the straightedge. Ensure uniform contact of the straightedge with the concrete over the entire length tested. Perform testing when the surface is free from soft mortar or excessive water. Use the testing straightedge exclusively for this purpose.

M. Work all laitance, surplus water, and inert material entirely off the pavement as soon as hand floating is completed when the float finisher method is not utilized. Smooth the surface by dragging with a rigid 10 foot straightedge and test the surface.

N. Finish the pavement by dragging a seamless strip of damp burlap or cotton fabric, not less than 5 feet nor more than 6 feet in width, over the full width of the pavement as soon as all excessive moisture disappears and while it remains possible to produce a uniform surface of gritty texture.

1. Pull the burlap or cotton drag by a bridge supported on pavement forms. Renew the fabric as often as necessary to obtain the required texture.

O. Finish the edges of the slab and all specified joints immediately after the initial finishing with burlap using an edging tool to the radii indicated on the Plans. Then give the pavement a final finish by dragging damp burlap or cotton fabric over the portion of the pavement disturbed by the edging operation.

3.14 SURFACE REQUIREMENTS

A. Remove or reduce high spots in the surface exceeding 1/8 inch from the straightedge but not more than 1/2 inch in 10 feet by rubbing with a carborundum brick and water until contact with coarse aggregate is made. Remove high spots that contact coarse aggregate before reaching acceptable tolerance using an approved surface-grinding machine before accepting the pavement.

B. Have the Engineer evaluate high spots exceeding 1/2 inch in 10 feet. Remove and replace the work at the Contractor's expense if it is rejected.

C. Take immediate steps to eliminate the cause of the defective surface.

3.15 CURING

A. Completely coat and seal the surface of the slab with a uniform layer of white membrane curing compound after finishing operations are completed and immediately after the free water has left the surface.

B. Apply the compound in a continuous uniform film using mechanically pumped pressure sprayer equipment at a rate of 1 gallon per 200 sft of surface. Do not thin the curing compound.

C. Provide equipment with adequate stirring of the compound during application. Ensure the equipment for applying the compound is on the Project and approved by the Engineer before starting Work.

D. Hand-spray equipment will be permitted only for the application of the curing compound over the sides of the slab, and for any minor damaged areas.

E. If rain falls on the newly coated pavement before the film has dried sufficiently to resist damage, or if the film is damaged in any other way, the Contractor will be required to apply a new coat of material to the affected areas.

F. Protect the treated surface from injury for at least seven (7) days. Consider all traffic, including foot traffic, injurious to the film of the applied compound. Permit only minimal foot traffic on the dried film as necessary to properly carry on the work, including removal of high spots. Immediately repair any damage to the film by applying a second coat of the compound.

G. Coat the entire area of the side of the slab with the curing compound immediately after removing the forms, applying it at the rate specified for the pavement surfacing.

H. Provide sufficient burlap or polyethylene coverings on the Project to protect the pavement in case of rain or spray equipment breakdown. Consider failure to provide proper curing as sufficient cause for immediate suspension of concreting operations.

3.16 REMOVAL OF FORMS

A. Remove forms from freshly placed concrete after it has set for 12 hours, provided no damage occurs to the pavement or curb edge. Cease form removal if damage occurs during the process, and wait until the concrete has attained greater strength before resuming.

   1. The period of time for removing forms may be increased or decreased when approved by the Engineer.

B. Clean the ends of all joints immediately after form removal. Fill any visible areas of honeycomb or minor defects with mortar composed of one part Portland cement and two (2) parts fine aggregate from the same source as used in the pavement, applying it with a wooden float.

   1. Take immediate steps to correct the conditions contributing to these defects.

C. Spray the sides of the pavement with curing compound immediately upon form removal, except where honeycombed areas require pointing, then cure those areas immediately.

D. Do not place forms and pins on new pavement being cured with membrane.

3.17 SAWING JOINTS

A. Saw contraction joints, longitudinal lane-tie joints with tie bars, and end of pour joints.

B. Saw joints before permitting any traffic on the pavement.

   1. The concrete saw will be permitted on the pavement to saw the joints, but the water supply truck will not be permitted on the pavement until the compressive strength is not less than 3,000 psi.

   2. When permitted on the pavement, the water supply truck must be kept a minimum of 50 feet behind the sawing operation.

C. Make at least two (2) approved concrete saws available for use at all times, ensuring one saw can cut a joint groove 2-1/2 inch deep.

D. Cut the saw groove for transverse end-of-pour joints to receive the joint sealing material.

E. Saw longitudinal lane-tie joints with tie bars according to the alignment and dimensions indicated on the Plans.

F. Saw the joint groove for joints formed in one operation before any transverse cracks develop. Repair raveling or spalling along the joint as specified elsewhere in this Section.

G. Saw transverse contraction joints in two stages:

   1. Stage 1 Sawing:

      a. Make the first stage a relief cut directly over the center of the load transfer assembly. Perform the initial relief cut as soon as the saw can be placed on the freshly poured concrete, and continue sawing as long as the pavement can support the saw without creating or appreciably raveling the joint.

      b. Apply membrane curing compound immediately when water is not used in the sawing operation.

c. Completely remove the slurry resulting from sawing when water is used by flushing the cut and immediate area with a jet of water. Apply additional membrane curing compound within 12 hours after making the relief cut.

2. Stage 2 Sawing:

a. Start the second stage of joint sawing only after the concrete has cured for a minimum of 48 hours. Center the joint groove over the relief cut and saw it to the specified dimensions shown on the Plans, including any increase in width of the relief cut due to shrinkage or contraction. Maintain a groove width tolerance of ± 1/16 inch.

b. Blow joints sawed without water clean of all foreign material using a jet of compressed air.

c. Completely remove the slurry resulting from the sawing operation when water was used by flushing the groove and immediate area with a jet of water, then blow dry with compressed air.

H. Perform a final cleaning of transverse joint grooves with a jet of compressed air adequate to remove all foreign material just before permanent sealing.

I. Temporarily seal the joint groove with a suitable material or device to prevent infiltration of foreign material if the specified seal is not installed within seven days of final sawing.

J. Do not permit traffic over the full width joint grooves before installing the permanent or temporary seal.

3.18 PATCHING JOINTS

A. General:

1. Inspect joints for spalls and voids after sawing and cleaning.

2. Remove loose, unsound, or damaged concrete to the satisfaction of the Engineer.

3. Classify spalls and voids as minor, intermediate, or major, and repair accordingly.

B. Minor Spalls:

1. Repair spalls or voids that increase the specified size of the joint groove beyond any limits, but less than 36 square inches, by patching with an approved epoxy mortar before installing the seal.

a. Spalls which extend more than 1/4 inch from the joint face and over 1/2 inch below the surface of the pavement.

b. Spalls which extend more than 1/4 inch from the joint face and 2 inches or more in length, regardless of the depth of spall below the surface of the pavement.

c. Void areas larger than 1/2 inch in diameter in the upper 1 inch of the joint face or larger than 1 inch in diameter regardless of location.

2. Thoroughly clean the spalled concrete surface by sandblasting, power-wire brushing, or hand-wire brushing. Then blow the patch area clean with a jet of compressed air.

3. Insert a heavy polyethylene sheet or rigid material into the joint groove and hold it tightly against the joint face to be patched.

4. Ensure concrete is clean and dry when placing epoxy resin mortar. Remove frost by heating with a clean heat source approved by the Engineer until dry. Take care not to damage the concrete during heating.

5. Epoxy binder will be a mixture of two (2) parts epoxy resin to one (1) part curing agent by volume, or as approved by the Engineer.

6. Mix epoxy resin compound in a clean metal or polyethylene container using an approved stirrer operating at 250 to 500 rpm. Gradually add the curing agent compound while mixing. Stir the mixture for a minimum of three (3) minutes until uniform.

7. Reserve a small portion of the thoroughly mixed epoxy binder for priming.

    a. Uniformly blend dry MDOT 2NS sand into the remaining mixture to create an epoxy mortar of stiff or trowelable consistency. Use one part of mixed binder to about 3.5 parts of dry sand by volume to achieve a workable mix.

8. Prime the spalled surface with freshly mixed epoxy binder by scrubbing it into the surface using a suitable applicator. Ensure complete wetting and coverage of all areas where the epoxy mortar must bond.

9. Place the epoxy mortar in the spalled area immediately after priming and finish it to match the shape of the original pavement surface. Apply a second coat if the bond coat is not tacky when placing the mortar. Ensure the patch edge conforms with the rest of the joint groove.

10. Sprinkle dry MDOT 2NS sand onto the fresh epoxy mortar surface to eliminate gloss. Carefully remove the polyethylene insert after the epoxy mortar has cured sufficiently to resist damage during sealing operations.

11. Clean joints finally with a jet of compressed air to remove foreign material.

12. Place the hot-poured elastic type joint seal the day following epoxy resin mortar patch placement when air and pavement temperatures exceed 50 degrees F. Determine curing time for epoxy mortar by the Engineer when air and concrete temperatures fall below 50 degrees F.

C. Intermediate Spalls:

1. Repair spalls larger than 36 square inches, but not extending below the reinforcing mat, by sawing and chiseling out unsound concrete and patching with Portland cement mortar.

2. Make a saw cut at least 1 inch deep parallel to the joint groove at the outer extremity of the spalled area. Chip out concrete to the saw cut to create a vertical face at the back of the repair area, and trim the two ends of the repair area to approximately vertical faces.

3. Sandblast the repair area to remove all loose particles, then blow it clean with a jet of compressed air to remove sand and other foreign materials.

4. Flush the repair area with clean water and blow out excess water with compressed air.

5. Insert a heavy polyethylene sheet or rigid material into the joint groove and hold it tightly against the joint face to be patched.
6. Prime the bottom and vertical faces of the repair area with a grout of creamy consistency made from a 1:1 mixture of Portland cement and MDOT 2NS sand with water.
7. The prime coat will be scrubbed into the surface with a suitable applicator to insure complete wetting and coverage of all areas to which the Portland cement mortar must bond.
8. Carefully apply cement grout to the rough surfaces of the spall area immediately before placing fresh mortar, ensuring the prime coat remains wet when covered by mortar.
9. Tamp Portland cement patching material into the repair area and finish it level with the pavement surface.
    a. Mix Portland cement mortar using 1 part Portland cement to two (2) parts MDOT 2NS sand with a water content not exceeding 4 gallons per sack of cement.
    b. Add a liquid air-entraining agent to maintain an air content of 8% to 11%.
    c. Calcium chloride in an amount of one (1) percent of the cement content may be added as an accelerator, if approved by the Engineer.
10. Match the edge of the patch at the joint face with the rest of the joint groove.
11. Spray white membrane curing compound on the patch surface immediately after casting and finishing the mortar.
12. After 72 hours, carefully remove the polyethylene form and clean all patched joints with a jet of compressed air to remove all foreign material.

D. Major Spalls:

1. Consider a joint damaged beneath the depth of the reinforcing mat as a major repair. Handle these major repairs individually under the direction of the Engineer.

3.19 SEALING JOINTS

A. Fill and seal transverse expansion, contraction, construction, and longitudinal bulkhead construction joints with an approved hot-poured elastic type compound.

B. Pressure fill and seal longitudinal lane-tie joints with either an approved hot-poured or cold-applied elastic type compound. Do not place these sealing compounds when atmospheric or pavement temperatures fall below 50 degrees F or during rainy or foggy weather.

C. After completing the shoulders and curing the pavement, clean the joints and pavement surfaces on each side of the joints of all extraneous matter.

1. Perform the cleaning by sandblasting or other methods approved by the Engineer that effectively clean the concrete.
2. Remove dust and sand present after sandblasting or cleaning with a jet of compressed air. Use hand tools to remove stones and other foreign materials from the joint groove.

D. Immediately after cleaning the joints with compressed air and drying the concrete surface in the joint, seal the joint with an approved hot-poured elastic type compound.

E. Melt the hot-poured compound in an approved double boiler type kettle. Do not use direct heating. Avoid using any sealing material heated beyond the safe heating temperature in the Work.

F. During the process of pouring the joints, the Engineer may, at his discretion, require that sufficient compound be taken from the melting unit to make flow tests.

G. Engineer may require the Contractor to modify his method of heating or of charging the heating unit with compound that will produce satisfactory results.

H. Pour from the melting kettle equipped with an approved pressure pump hose and nozzle.

I. When authorized by the Engineer, the sealing compound may be poured with a hand-type pouring pot for curbs and short miscellaneous joint lengths, provided a satisfactory joint is obtained.

J. Pour the sealing compound to fill the joint to 1/4 inch below the top of the pavement. Immediately remove any sealing compound spilled on the pavement surface.

K. After the first pour cools to pavement temperature and settles, make a second pour to bring the sealing compound to 1/4 inch below the pavement surface.

L. Do not permit traffic over the poured joint until the compound hardens sufficiently to resist pickup.

M. Cover the sealed joint with a 1-1/2 inches wide strip of paper or other approved means immediately after applying the compound to protect hot-poured and cold-applied sealing compound during curing and prevent pickup by traffic. Leave the paper strip in place until worn off by traffic.

3.20 TRAFFIC CONTROL

A. Provide measures necessary to protect and maintain traffic and to protect the Work in accordance with Section 01 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. Adequately protect the new concrete from rain effects before it hardens sufficiently.

B. Keep enough burlap or 6 mil polyethylene film available on the job site at all times to cover and protect one day's Work.

C. Stop all operations and begin covering when rain appears imminent.

D. Uncover the concrete as soon as the rain ceases and drag the surface burlap where necessary.

E. Apply curing compound to any areas where it has been disturbed or washed away. Protect the new concrete against rain at the Contractor's expense.

3.22 COLD WEATHER PROTECTION

A. Keep a sufficient amount of clean, dry straw or hay, polyethylene film, or other approved materials on-site to cover at least one day's production whenever freezing temperatures threaten. Provide cold weather protection at the Contractor's expense. Use temperature forecasts prepared by the local weather bureau, recognized as the Official Weather Bureau for the construction area. Use the predicted low temperature expected during the next 24 hours.

B. Do not charge frozen material into the mixer at any time.

C. Remove frost or ice from the forms and any steel used in the pavement before placing concrete.

D. Do not place concrete directly on a frozen subgrade. Cover the subgrade with a 12 inch layer of straw or hay to protect it against freezing. Remove the straw or hay from the finished subgrade immediately ahead of paving operations and pile it along the construction line for covering the finished pavement. Clean the subgrade of loose straw and prepare it in a manner satisfactory to the Engineer before placing concrete. Use other covering materials approved by the Engineer to prevent subgrade freezing.

E. Add calcium chloride to the mix to accelerate concrete hardening when the air temperature in the shade and away from artificial heat ranges between 40 and 45 degrees F at the rate approved by the Engineer. Spread calcium chloride on the materials immediately before discharging them into the mixer drum. Use a method approved by the Engineer to measure the amount of dry calcium chloride added to each concrete batch. Do not place calcium chloride in direct contact with the cement.

F. Immediately after finishing the concrete and as soon as it hardens sufficiently, cover the pavement and keep the protective covering in place until the concrete develops a compressive strength of at least 3,000 psi or for a minimum period of 14 days or as approved by the Engineer.

G. Place the protective covering around and over the forms, extending beyond the pavement edge by a distance at least equal to the required depth of covering.

H. When removing forms, the protective covering should be removed for as short a time as possible and should be replaced promptly to prevent loss of heat.

I. Stop mixing and placing concrete each day in sufficient time to finish the concrete and place the required protective covering during daylight hours.

J. The requirements specified herein for the curing and protection of concrete in cold weather are minimum requirements, and the Contractor will be responsible for the quality and strength of the concrete placed. Any concrete injured by frost action must 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, protect the pavement and keep the protective covering in place until the concrete develops a compressive strength of at least 3,000 psi or for a minimum of 14 days unless otherwise authorized by the Engineer.

L. Special Protection:

1. Do not place pavement between October 15 and May 15 unless specifically provided for in the Contract Documents or authorized by the Engineer. Do not place concrete when the

predicted high temperature falls below the specified limit without written permission from the Engineer. Apply the following requirements when paving is permitted during this period:

a. Maintain the concrete temperature between 50 and 85 degrees F when placing it on the subgrade.

b. Heat the mixing water, aggregates, or both as required by the Engineer to maintain a mix temperature between 50 and 85 degrees F. Heat the water and aggregates to no more than 150 degrees F.

1) Heat aggregates using steam pipes under the aggregate piles, free steam discharged into the aggregate piles, or steam pipes in the batching bins.

2) Control heating of the water and aggregates to prevent large temperature differences between batches.

c. Ensure all necessary materials for covering and protecting the concrete, equipment for heating water and aggregates when required, and calcium chloride are on the Project and available for immediate use before placing any pavement when the predicted low temperature risks dropping below 35 degrees F.

d. For predicted low temperatures from 35 to 25 degrees F, place either 1-layer of waterproof paper blankets or 12 inches of loose dry straw or hay.

e. For predicted low temperatures of 25 to 20 degrees F, place 1-layer of waterproof paper blankets and 12 inches of loose dry straw or hay.

f. For predicted low temperatures less than 20 degrees F the minimum requirement for cold weather protection will be 1-layer of waterproof paper blankets and 12 inches of loose dry straw or hay overlayed with a waterproof protective covering consisting of tarpaulins, paper blankets, polyethylene sheeting or other approved material.

2. Protect all concrete placed within the preceding 72 hours similarly when temperatures require special protection as specified above.

3. Continue special protection once started until design strength is reached per the above requirements unless warmer temperatures prevail for at least 48 hours. Obtain Engineer approval to eliminate special protection for such a period.

M. Provide protection of the new concrete against cold weather, including ordinary and special protection, at the Contractor's expense.

3.23 CONCRETE TEMPERATURE LIMITATIONS

A. Do not place concrete when its temperature at the point of placement exceeds 90 degrees F.

3.24 CURB DROP

A. Provide curb drops for existing and future sidewalk ramps, approaches for existing driveways, and other locations determined by the Engineer.

B. Install curb drops for sidewalks according to the current rules and regulations of Act 8, Michigan PA 1973, as amended. Center curb drops for drive approaches with the existing driveway at the property line.

C. Make the width of the residential curb drop equal to the width of the driveway at the property line plus four feet. Unless otherwise approved by the Engineer, maintain a minimum width of 14 feet for the residential curb drop.

3.25 SHOULDERS

A. Construct the shoulders according to the lines, grades, and cross section shown on the Plans and as specified for the required shoulder material type. Sequence the shoulders with surfacing operations to complete them no more than seven (7) days after the curing period expires unless directed otherwise by the Engineer.

B. Construct aggregate shoulders as specified under Section 32 1123, Aggregate Base Courses, when called for.

3.26 CLEANUP

A. Remove the fixed forms after the concrete gains sufficient strength, but not sooner than 12 hours, and immediately backfill the spaces on both sides with sound earth of topsoil quality.

B. Compact, level, and leave the backfill in a neat, workmanlike condition.

C. At a seasonally correct time approved by the Engineer, the disturbed area must 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. Engineer reserves the right to require that curing operations be discontinued when the concrete has reached 85% of the design strength, and to require that the shoulders be completed and the slab be opened to traffic.

3.28 MONUMENT BOXES

A. Preserve government, plat, and street intersection monuments within existing or proposed pavement by enclosing them in standard monument boxes.

B. Furnish and install monument box castings.

C. Adjust existing monument boxes to meet the proposed pavement elevation by removing the castings and resetting them to the required elevation.

D. Construct concrete bedding to support the monument box firmly in place.

E. Replace adjacent pavement, curb, or curb and gutter to the new elevation, condition, and construction type unless otherwise provided.

3.29 TESTING

A. During the course of the Work, 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. Charge the Owner for making cylinders, drilling cores, and testing.

C. For each lane of Work:

1. Make at least one (1) cylinder for testing compressive strength for each 500 feet or fraction thereof, or as determined by the Engineer.

2. Drill at least two (2) cores for testing compressive strength and checking thickness for each 500 feet or fraction thereof.

D. Conduct slump tests for Portland cement concrete consistency according to ASTM C143/C143M and ASTM C172/C172M.

E. Adjust the unit price for concrete based on the average of three (3) cores when test results on a core indicate a deficiency in thickness or compressive strength, or when test results on a cylinder indicate a deficiency in compressive strength, as follows:

1. Thickness

Under Required Thickness	Percent of Reduction in Unit Price
0 to 1/4 inch	None
by more than 1/4 but not exceeding 1/2 inch	20
by more than 1/2 but not exceeding 1 inch	50
by more than 1 inch	Remove & Replace

2. Compressive Strength

Under Required Compressive Strength	Percent of Reduction in Unit Price
0 to 150 psi	None
by more than 150 but not exceeding 300 psi	20
by more than 300 but not exceeding 500 psi	50
by more than 500 psi	Remove & Replace

3. Reduction in the unit price are additive, that is if an area is deficient by 3/8 inch and is under strength by 200 psi, the total reduction is 20% plus 20% or a reduction of 40%.

4. Determine the area of a deficient core by drilling and testing two (2) additional cores, one (1) on each side of the deficient core and 20 feet from it, when possible.

5. Charge the extra core drilling and testing to the Contractor's expense.

END OF SECTION

SECTION 32 13 15 - SIDEWALKS AND DRIVEWAYS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes sidewalks, sidewalk ramps, driveways, and drive approaches complete with concrete materials, concrete curing compounds, joint materials, field quality control and appurtenances.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 33 00 - Submittal Procedures

C. Section 31 11 00 - Clearing and Grubbing

D. Section 31 23 13 - Subgrade Preparation

E. Section 32 92 19 - Seeding

F. Section 32 92 23 - Sodding

1.03 REFERENCE STANDARDS

A. Unless otherwise specified, the Work for this Section will conform to the applicable portions of the following:

1. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
2. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
3. ASTM C94/C94M Standard Specification for Ready-Mixed Concrete
4. ASTM C150/C150M - Standard Specification for Portland Cement
5. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
6. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
7. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
8. AASHTO T26 - Standard Method of Test for Determination of Organic Content in Soils by Loss on Ignition
9. MDOT - Michigan Department of Transportation, Standard Specifications for Construction, latest edition.

1.04 SUBMITTALS

A. Obtain written permission for the use of all local disposal sites and furnish copies to the Engineer.

B. Provide, at the request of the Engineer, certification that the various materials to be used conform to the ASTM Standards referred to in the Specification.

1.05 TEST REPORTS

A. Provide two (2) certified copies of the test results of the thickness and compressive strength of the concrete. The core drilling, testing for thickness and compressive strength and the certification of the test results will be performed by a testing laboratory approved by the Engineer.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Comply with the requirements for concrete installation due to outside ambient air temperatures specified under Part 3 of this Section.

1.07 PROTECTION

A. Comply with the requirements for protecting new Work against damage from rain, as specified under Part 3 of this Section.

B. Comply with the requirements for protecting new Work against damage from cold weather, as specified under Part 3 of this Section.

PART 2 PRODUCTS

2.01 CONCRETE

A. Concrete will conform to MDOT Section 1004, use 3,500 psi strength concrete; Type IA cement; MDOT 6A coarse aggregate; MDOT 2NS fine aggregate; 3 inch maximum slump; no admixtures without the Engineer's approval.

B. USe ready-mixed concrete in accordance with ASTM C94/C94M, Alternate 2 unless a written request for other than ready-mixed concrete has been submitted, reviewed and approved by the Engineer.

C. Provide documentation from actual mixes used on projects showing 28 day compressive strength of not less than 3,500 psi when tested under field conditions.

D. Mixes will contain a minimum of 25% Type F fly ash.

1. Water reducers, additional fly ash, ground granulated blast furnace slag (GGBFS), and other pozzolans, may be used when approved by the Engineer.

    a. Fly ash quantity will not exceed 40%;

    b. GGBFS quantity will not be less than 25% and not more than 40%;

    c. Maximum total replacement of cement will not exceed 40%;

    d. GGBFS and fly ash must replace cement on a pound for pound basis.

E. Use air-entraining Portland cement conforming to ASTM C150/C150M, Type 1A. If high-early strength concrete is desired, Type IIIA is required.

F. High-early concrete can be obtained for small areas by the addition of one sack of cement, Type 1A, per cubic yard of concrete (94 lbs/cyd).

G. Air content of the concrete will be 6.5% ± 1.5% by volume.

2.02 WATER

A. Water to be used for mixing and curing concrete will be reasonably clean and free from oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.

B. Waters from sources approved by the Michigan State Department of Public Health as potable may be used without test.

C. Water requiring testing will be tested in accordance with the current Method of Test for Quality of Water to be Used in Concrete in AASHTO T26, and as specified in MDOT, Section 911.

2.03 CONCRETE CURING COMPOUNDS

A. White membrane curing compound for curing concrete will conform to ASTM C309, Type 2, Class B Vehicle, and as specified in MDOT, Section 911.

2.04 PREMOLDED JOINT FILLER

A. Fiber joint filler for expansion joints will conform to ASTM D1751. Filler will be of the thickness, as specified herein or on the Plans, or as approved by the Engineer.

2.05 STEEL HOOK BOLTS

A. Hook bolts will conform to ASTM A706/A706M, or Grade 60 of ASTM A615/A615M, or ASTM A996/A996M. Hook bolts will be 5/8 inch (16 mm) diameter.

2.06 JOINT SEALANT

A. Hot-poured type joint sealant will conform to ASTM D6690, Type II, and as specified in MDOT Section 914.04.

PART 3 EXECUTION

3.01 VERIFICATION OF EXCAVATION AND FORMING

A. Prior to the installation of any concrete, examine the excavation and forms for the proper grades, lines, and levels required to receive the new Work. Ascertain that excavation and compacted subgrades are adequate to receive the concrete to be installed.

B. Correct defects and deficiencies before proceeding with the Work.

3.02 EXISTING IMPROVEMENTS

A. Investigate and verify location of existing improvements to which the new Work is to be connected.

B. Adjustments in line and grade to align the new Work with the existing improvements must be approved by the Engineer prior to any change.

3.03 FORMING

A. Forms will be of wood or metal, straight and free from warp, clean, and of sufficient strength to resist springing during the process of depositing concrete against them.

B. Forms will be the full depth of the concrete.

3.04 SIDEWALKS, SIDEWALK RAMPS, DRIVEWAYS, AND DRIVEWAY APPROACHES

A. Unless otherwise noted in the Contract Documents, sidewalks and sidewalk ramps will be 4 inches thick except at driveways, where the thickness of the sidewalks will be 6 inches.

B. Sidewalks will be 5 feet wide, unless otherwise noted on Plans, and slope 1/4 inch/ft towards the surface drainage side, which in general will be towards the center of the road. Sidewalks will be located within the right-of-way, parallel the property lines, at a distance of 1 foot from the property line, unless otherwise shown on the Plans or as determined by the Engineer.

C. Driveways and approaches will be 6 inches thick. The width of driveways and driveway approaches will be as specified on the Plans or as determined by the Engineer.

3.05 REMOVE CURB FOR CURB DROP

A. Construction of sidewalk ramps within street intersections where curbed pavement exists will conform to the current rules and regulations of Act 8, Michigan PA 1973.

B. Where there is no proper curb drop for the sidewalk ramp or driveway approach, saw cut, to full depth of pavement, and remove a minimum of an 18 inch wide curb and gutter section. When mountable curbs are present, remove a 24 inch wide curb and gutter section for the construction of sidewalk ramp, as specified herein.

C. The length of curb and gutter removal will be determined by the Engineer in the field but will be at least as wide as the proposed sidewalk ramp plus 1 foot on each side.

D. The removed curb and gutter section will be replaced with material, equal to what was removed and the joint sealed with hot poured rubber asphalt.

E. Install 5/8 inch diameter self-tapping hook bolts, in the existing concrete pavement as indicated on the Plans, prior to placing concrete for the removed curb and gutter section.

F. Curbs may be cut or ground down with an approved concrete grinder when the final results will leave the cut or ground down curb in a smooth, clean condition acceptable to the Engineer. Curbs that are cut or ground down that are not acceptable to the Engineer, will be removed and replaced at Contractor's expense.

3.06 PLACEMENT OF FORMS

A. Wood forms, straight and free from warp, of nominal depth may be used for sidewalk sections less than 25 feet in length.

B. Stake forms to line and grade in a manner that will prevent deflection and settlement.

C. When unit slab areas are to be poured, slab division forms will be placed so that the slab division joints will be straight and continuous.

D. Set forms for sidewalk ramps to provide a grade toward the centerline of the right-of-way in accordance with current standards. The grade must be uniform, except as may be necessary to eliminate short grade changes.

E. Oil forms before placing concrete. Forms will remain in place at least 12 hours after the concrete is placed. Ensure sufficient forms are placed ahead of the pouring operations to maintain uninterrupted placement of concrete.

F. The use of slip form pavers can be allowed when approved by the Engineer in lieu of the construction system described above.

3.07 JOINTS

A. Transverse and longitudinal expansion and plane-of-weakness joints will be constructed at the locations specified herein, as indicated on the Plans, or as approved by the Engineer.

B. Place transverse expansion joints for the full width and depth of the new Work. The transverse expansion joints placed against any existing pavement must be a minimum of 6 inches deep, but no less than the thickness of the concrete being placed.

C. Longitudinal expansion joints must conform to the same requirements as transverse expansion joints.

D. Construct joints true to line with their faces perpendicular to the surface of the sidewalk. The top will be slightly below the finished surface of the sidewalk. Construct transverse joints at right angles to the centerline of the sidewalk, and longitudinal joints parallel to the centerline, or as determined by the Engineer.

E. Unless otherwise specified on the Plans or unless otherwise determined by the Engineer, when the sidewalk is constructed in partial width slabs, transverse joints in the succeeding slabs will be placed in line with like joints in the adjacent slab. Also, in the case of widening existing sidewalks, place transverse joints in line with like joint in the existing sidewalk.

F. Place transverse expansion joints, 1/2 inch thick, through the sidewalk at uniform intervals of not more than 50 feet and elsewhere as shown on the Plans, or as determined by the Engineer.

G. Place expansion joints, 1/2 inch thick, between the sidewalk and back of abutting parallel curbs, buildings or other rigid structures; concrete driveways and driveway approaches.

H. Place expansions joint between sidewalks and buildings 1 foot from the property line and parallel to it.

I. Place expansion joints, 1 inch thick, between sidewalk ramps or driveway approaches and the back of curbs.

J. Form plane-of-weakness joints every 5 feet using slab divisions forms extending to the full depth of the concrete or by cutting joints in the concrete, after floating, to a depth equal to 1/4 the thickness of the sidewalk. The cut joints will not be less than 1/8 inch nor more than 1/4 inch in width and will be finished smooth and will be at right angles to the centerline of the sidewalk.

3.08 PLACING AND FINISHING CONCRETE

A. Place concrete on a prepared unfrozen, smooth, leveled, rolled and properly compacted base as indicated on the Plans. Moisten the surface of the subbase; no visible water is to be present prior to placement of the concrete.

B. Deposit concrete in a single layer, to the depth specified here in or shown on the Plans. Concrete will be thoroughly spaded or vibrated and compacted to fill in voids along the forms and joints. Concrete will be struck off with a strike board until voids are removed and the surface has the required grade and cross section as indicated on the Plans.

C. Float the surface of the concrete produce a smooth surface free from irregularities. Round edges and joints with an edger having a 1/4 inch radius. Broom the surface of sidewalks, driveways and approaches to slightly roughen the surface.

D. Provide texture on the surface of sidewalk ramps using a coarse broom transversely to the ramp slope. The texture on sidewalk ramps will be coarser than the remainder of the sidewalk.

3.09 CURING

A. After finishing operations have been completed and immediately after the free water has left the surface, the surface of the concrete (and sides if slip-forming is used) must be completely coated and sealed with a uniform layer of white membrane curing compound. Do not thin the curing compound. Apply the curing compound at the rate of 1 gallon per 200 square feet of surface.

3.10 BARRICADES

A. Place suitable barricades and lights around newly poured sidewalks, sidewalk ramps, driveways, driveway approaches and curb and gutter section to protect the new Work from damage from pedestrians, vehicles and others until the concrete has hardened.

B. Leave barricades in place for a minimum of two (2) days, except for driveway approaches and curb and gutter section where barricades are to remain in place for a minimum of three (3) days.

C. Remove and replace concrete that suffers surface or structural damage at the Contractor's expense.

3.11 PROTECTION

A. Protect the new concrete from the effects of rain before the concrete has sufficiently hardened. Contractor will have available on the job site enough burlap or 6 mil polyethylene film to cover and protect the work.

1. When rain appears eminent, concrete operations will stop and personnel will begin covering. As soon as the rain ceases, uncover the concrete.

2. Apply curing compound to areas where the compound has been disturbed or washed away.

B. If concrete is placed between October 15 and May 15, provide a sufficient amount of clean, dry straw or hay to cover one day's production.

1. Place hay or straw a minimum of 12 inches if the temperature reaches 40 degrees F and is falling immediately after the curing compound is applied.

2. Place a 6 mil polyurethane film on concrete if the temperature is 30 degrees F and falling as soon as the surface moisture has disappeared, then covered with a minimum of 12 inches of straw or hay.

3. Whenever the temperature in the shade falls below 50 degrees F, the water, sand and coarse aggregate will be heated in that order sufficiently to maintain a uniform temperature of the concrete between 70 to 80 degrees F.

C. Do not place concrete when the temperature of the concrete at the point of placement is above 90 degrees F.

3.12 CLEANUP

A. Remove the fixed forms after the concrete has gained sufficient strength, but no sooner than within 12 hours, and immediately backfill the spaces on both sides with sound earth of topsoil quality. Compact backfill, level and leave in a neat condition.

B. At a seasonally correct time approved by the Engineer, rake the disturbed area then place topsoil. Fertilize and seed per the requirements of Section 32 92 19

3.13 TESTING

A. Engineer may require that a minimum of two cores be drilled from the sidewalk for each 500 linear foot (or fraction thereof) section placed. At least one (1) core out of two (2) required will be taken from the sidewalk at the driveway.

B. One (1) core may be required for every 20 driveway approaches or sidewalk ramps installed.

C. Check cores for depth and compressive strength.

1. Core drilling and tests will be done by a testing laboratory designated by the Owner and at the expense of the Contractor.

2. Furnish two certified copies of the test results from the testing laboratory to the Engineer.

D. In the event the test results on a core indicates a deficiency in either thickness or compressive strength the following adjustments in the unit price for concrete will be made:

1. Thickness

Under Required Thickness	Percent of Reduction in Unit Price
0 to 1/4 inch	None
more than 1/4 but not exceeding 1/2 inch	20
more than 1/2 but not exceeding 1 inch	50
more than 1 inch	Remove & Replace

2. Compressive Strength

Under Required Compressive Strength	Percent of Reduction in Unit Price
o to 150 psi	None
more than 150 but not exceeding 300 psi	20
more than 300 but not exceeding 500 psi	50
more than 500 psi	Remove & Replace

E. The area of the deficient core will be determined by the drilling and testing of two (2) additional cores, one (1) on each side of the deficient core and 20 feet from it when possible.

1. The extra core drilling and testing will be at the expense of the Contractor.
2. Reductions due to deficiencies in thickness or compressive strength are additive, that is, if an area is deficient by 3/8 inch and under strength by 200 psi, the total reduction is 20% plus 20% or 40% reduction.

END OF SECTION

SECTION 32 17 23 - PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes pavement markings complete with materials, layout of markings and preparation of pavement surfaces.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 33 00 - Submittal Procedures

1.03 REFERENCE STANDARDS

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

1. ASTM D4505: Standard Specification for Preformed Retroreflective Pavement Marking Tape for Extended Service Life
2. ASTM D4592: Standard Specification for Preformed Retroreflective Pavement Marking Tape for Limited Service Life
3. AASHTO M 247: Standard Specification for Glass Beads Used in Pavement Markings
4. AASHTO M 249: Standard Specification for White and Yellow Reflective Thermoplastic Striping Material (Solid Form)
5. AASHTO MP 24: Standard Specification for Waterborne White and Yellow Traffic Paints
6. FS TT-P-1952: Paint, Traffic And Airfield Marking, Waterborne
7. MDOT: Michigan Department of Transportation, Standard Specifications for Construction, latest edition

1.04 REQUIREMENTS OF REGULATORY AGENCIES

A. Conform pavement markings to the current requirements of the Michigan Manual of Uniform Traffic Control Devices (MMUTCD) issued under provisions of the Michigan Vehicle Code, Act 300, PA 1949, as amended, where applicable.

B. ADA pavement markings will comply with State and Federal guidelines.

1.05 SUBMITTAL OF MANUFACTURER'S LITERATURE

A. Submit manufacturer's literature for all paints to be used in the Work. Ensure the literature includes paint type, texture, color, temperature limitations, recommended use, spreading rate, drying time, and cleanup instructions.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver all materials to the Project site in original, unopened waterproof containers. Ensure packaging containers bear intact and legible manufacturing labels.

B. Ensure the label contains the following information: name and address of the manufacturer, shipping point, trademark or trade name, kind of paint, formula, amount in U.S. gallons, date of manufacture, lot number, type of paint, and AASHTO Specification Number.

C. Store all materials in waterproof containers, under protective covering, off the ground and away from extreme heat or cold until ready for use.

D. Handle materials in accordance with the manufacturer's recommendations.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Comply with the appropriate environmental limitations (air temperature, pavement temperature, and relative humidity) as outlined in MDOT Section 811.03.D.

PART 2 PRODUCTS

2.01 REGULAR DRY TRAFFIC MARKING PAINT

A. Ensure regular drying pavement marking paint in white and yellow colors complies with MDOT Section 920.

1. Select regular dry traffic paint from MDOT’s Qualified Products List.

2.02 WATERBORNE PAVEMENT MARKING PAINT

A. Ensure waterborne pavement marking material in white, yellow, and blue colors complies with FS TT-P-1952 (Type I, II, or III), AASHTO MP 24 and MDOT Section 920.

1. Select waterborne pavement marking paint from MDOT’s Qualified Products List.

2.03 THERMOPLASTIC PAVEMENT MARKINGS

A. Ensure hot-applied thermoplastic pavement markings in white and yellow colors conform to AASHTO M 249, white, yellow and blue thermoplastic striping materials (solid form), and MDOT Section 920.

1. Select hot-applied thermoplastic paving marking from MDOT’s Qualified Products List.

2.04 COLD PLASTIC PAVEMENT MARKINGS

A. Ensure preformed cold plastic pavement markings in white, yellow, and blue colors comply with ASTM D4505 and conform to MDOT Section 920.

1. Select cold-applied plastic pavement markings from MDOT’s Qualified Products List.

2.05 POLYUREA PAVEMENT MARKINGS

A. Ensure two-component, polyurea pavement marking material in white, yellow, and blue colors conforms to MDOT Section 920.

1. Select polyurea pavement marking material from MDOT’s Qualified Products List.

2.06 TEMPORARY PAVEMENT MARKING TAPE

A. Ensure temporary pavement markings comply with ASTM D4592, Type R and Type NR, and conform to MDOT Section 922.06.A.

1. Select temporary pavement markings from MDOT’s Qualified Products List.

2.07 GLASS BEADS

A. Ensure glass beads for reflectorizing white, yellow, and blue paint markings by the drop-in method on fresh paint stripes comply with AASHTO M 247 and conform to MDOT Section 920.02.

1. Select glass beads for use in pavement markings for the specified type of paint from MDOT's Qualified Products List.

PART 3 EXECUTION

3.01 VERIFICATION OF EXISTING CONDITIONS

A. Prior to the placing of any pavement markings, examine the limits of the new Work and ascertain that the existing surfaces are adequate to receive the material to be installed.

3.02 PREPARATION OF SURFACE

A. Surfaces to be painted must be thoroughly dry and free from dirt, loose paint, oil, grease, wax and other contaminants.

B. Include the costs incurred for removing and disposing of unsuitable materials in preparation of surfaces to receive the new Work as incidental to the price paid for the pavement markings.

3.03 PERFORMANCE - GENERAL

A. Limit the pavement marking operation to the type of Work and the limits specified on the Plans. If additional area is required for storage of equipment or supplies, provide the Engineer with written permission from the property owner of the storage area, permitting the storage.

B. Conduct operations and use equipment in such a manner that traffic is maintained throughout the Project, unless otherwise specified on the Plans or approved by the Engineer.

C. Maintain traffic for Work within public rights-of-way and other areas as determined by the Engineer, in accordance with the Michigan Manual of Uniform Traffic Control Devices (MMUTCD). Costs incurred in maintaining traffic will be at Contractor's expense.

D. Equip the Contractor's equipment with sufficient paint capacity to enable sustained pavement marking operations, ensuring uniform application of paint and thermoplastic pavement markings.

1. Equip the machinery with mechanical or pressurized bead dispensers. Ensure the equipment is sufficient to accomplish the marking operations safely, efficiently, and in a workmanlike manner.

2. For parking lots and other small areas, approved portable equipment and use of hand methods will be allowed.

E. Use the color of the paint, and the width or type of markings as specified on the Plans or as directed by the Engineer.

F. Apply markings so they adhere adequately to the surface.

G. Apply markings in accordance with the applicable requirements of MDOT Section 811 for permanent pavement markings or MDOT Section 812.03 for temporary pavement markings.

1. Remove temporary pavement markings as incidental to the Project, unless otherwise specified.

3.04 LAYOUT FOR MARKINGS

A. Layout work necessary for the location and placing of markings, as specified on the Plans or as determined by Engineer, will be the responsibility of Contractor and will be at his expense.

3.05 APPLICATION OF WATERBORNE MARKINGS

A. Apply waterborne paint when the air temperature is 50 degrees F or higher and the pavement is dry.

B. Contractor will be responsible for making the decision to apply waterborne paint on any specific day when there is a high probability of rain in the forecast.

1. Reapply lines at no additional expense to the Owner if applied lines are washed away due to rain.

C. Waterborne pavement marking materials may be placed immediately on new bituminous pavement.

1. Do not place waterborne pavement marking material before May 1 or after October 1.

D. Apply waterborne paint with an application thickness of 15-mil and 8-mil dry thickness. Add glass beads at the rate of 32 lbs per mile per 4 inch line during the application process.

3.06 APPLICATION OF PRE-FORMED HOT-APPLIED THERMOPLASTIC MARKINGS

A. Since subsurface moisture can be present in amounts sufficient to affect proper bonding of the hot-applied thermoplastic material, Contractor will be responsible for insuring that the pavement is free of excess moisture that may effect proper bonding prior to beginning work.

B. Document the testing for moisture and provide the results to the Engineer.

C. Start marking operations when the minimum ambient air temperature is 48 degrees F and rising. If the air temperature falls below 45 degrees F and continued cooling is expected, stop all work. The minimum pavement temperature is 50 degrees F.

D. Heat and apply thermoplastic material within the temperature range recommended by the manufacturer.

1. Do not place thermoplastic material before May 14 or after October 1.

3.07 APPLICATION OF POLYUREA PAVEMENT MARKINGS

A. Do not apply polyurea pavement markings over existing non-polyurea pavement markings.

B. Completely remove existing non-polyurea pavement markings before applying polyurea pavement markings.

C. Remove curing compounds from concrete pavement.

D. Apply at a 15 to 25-mil thickness. Ensure the pavement is clean and dry. The pavement temperature must be 40 degrees F or higher, unless otherwise approved by the Engineer.

3.08 TOLERANCES

A. Place new and/or retraced markings in their proper locations, with reasonable tolerance.

B. Obliterate incorrect or misplaced markings and remark them according to the Engineer's instructions.

C. Costs incurred to obliterate and remark incorrect or misplaced markings will be at Contractor's expense.

3.09 PROTECTION OF MARKINGS

A. Protect wet paint and thermoplastic pavement markings, with the Contractor responsible for all related costs.

3.10 WEATHER AND TIME LIMITATIONS

A. Do not place markings when rain is threatening or when the surface to be painted is wet.

B. Perform pavement marking between May 1 and November 1, unless otherwise approved in writing by the Engineer.

C. Do not apply markings when the air temperature is less than 50 degrees F, as determined by the Engineer.

END OF SECTION

SECTION 32 92 19 - SEEDING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes seeding complete with earth bed preparation, providing and placing topsoil, preparation and fertilizing topsoil, sowing of seed for lawns and other ground cover, protection of seeded areas, watering of seeded areas, mowing of seeded areas, protection and cleanup.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 22 00 - Unit Prices

B. Section 01 33 00 - Submittal Procedures

C. Section 01 89 00 - Site Construction Performance Requirements

D. Section 31 22 00 - Grading

E. Section 32 92 23 - Sodding

1.03 REQUIREMENTS OF REGULATORY AGENCIES

A. Comply with the applicable requirements of the Michigan Seed Law, Act 329, PA of 1965, as amended.

B. Comply with the applicable requirements of the AOSA Rules for Testing Seeds.

C. Supply chemical fertilizer in suitable bags with the net weight of the contents and guaranteed analysis shown on the container. Accompany bulk shipments with an analysis and net weight certification of the shipment.

1. Accompany custom mixed fertilizers with a certification of the weight of each commercial fertilizer used in the mixture and a guaranteed analysis of each shipment, expressed in percentages of total Nitrogen (N), total available Phosphoric Acid (P2O5), and total available Potash (K2O).

1.04 SOURCE QUALITY CONTROL

A. Test the seed mixture for purity and germination by the Seed Producer within nine (9) months of sowing.

1.05 REFERENCE STANDARDS

1. AOSA RULES - Association of Official Seed Analysts

2. ASTM C602: Standard Specification for Agricultural Liming Materials

3. ASTM D977: Standard Specification for Emulsified Asphalt

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

1.06 SUBMITTALS

A. Submit Seed Producers Certification that seed meets the requirements of these Specifications and conform to the State of Michigan Seed Act referenced above.

B. Where required, submit test reports for all seed proposed for use in the Work to the Engineer, showing results of purity and germination tests, compliance with regulatory agencies, dates and location of tests.

C. Perform soil tests -1 per designated area - to confirm the fertilizer and lime necessary for the site. Limit the amount of fertilizer and lime to what is absolutely necessary to ensure optimal growth.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project site in their original, unopened containers. Mark containers clearly with the name of the manufacturer, brand name, trade name or generic name of material, warranty of analysis, net weight of contents, and date of packaging, where applicable.

B. Deliver seed to the site in durable bags, tagged or labeled with the date of tests, warranty of purity and germination analysis, name, lot number, and net weight of contents.

C. Deliver commercial fertilizers to the site of the Work in original unopened bags. Ensure bags do not exceed 100 lbs net weight each and are clearly marked with guaranteed analysis in a conspicuous location on each bag.

D. Store material at the Project site, under shelter, off the ground, and protect it from damage by moisture, temperature, exposure to elements, vandalism, or any other action that might impair its use.

E. Handle materials proposed for use in the Work in a manner that protects both the material and the personnel involved. Handle seed to protect the mixture from contamination or deterioration.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Seeding is limited to the periods between April 20 and June 1, and August 10 to October 10 and after for as long as weather permits preparation of the seed bed without irrigation and the ground is not frozen. With the use of irrigation and/or mulch, seeding can be done from April 20 thru October 1 inclusively.

B. Comply with the limitations placed on the use of certain soil protection materials because of prevailing temperatures as described in this Section.

C. Comply with the limitation placed on seeding applications because of wind velocity as described in this Section.

1.09 PROTECTION

A. Provide suitably approved warning signs and barricades for protection of seeded areas from pedestrian or vehicular traffic. Protect newly seeded areas during the progress of the Work and until completion of the turf establishment period.

B. Protect adjacent construction from topsoil spills and perform such cleanup of affected surfaces before it becomes compacted by traffic.

1.10 FINAL ACCEPTANCE

A. Establish a dense cover of seeded grass on all disturbed areas and maintain these areas until final acceptance of the Work by the Engineer. The Engineer will inspect the turf to ensure the grass seed is well established, weed-free, and in a growing, vigorous condition. Re-seed areas that do not meet the Engineer's approval at the Contractor's expense.

PART 2 PRODUCTS

2.01 SEED

A. Use certified, mature, clean, dry, new crop seed products suitable for the specified applications. Ensure seed and seeding mixtures have the percentages of purity, germination, and proportions, by weight, as indicated in Table 1.

Table 1 - Seeding Mixtures

Kind	Seeds		Mixture Proportions (%)			
	Purity	Germination	TDS	TUF	TGM	THM
Kentucky Blue Grass	98%	80%	5	10	10	30
Perennial Rye Grass	96%	85%	25	20	20	20
Hard Fescue	97%	85%	25	20	30	
Creeping Red Fescue	97%	85%	45	40	40	50
Fults Salt Grass	98%	85%*		10		

B. Use the specific mixture for the type of soil on the Project and the location of the seeding per Table 2, unless otherwise indicated on the Plans or designated by the Engineer.

Table 2 - Soil Types and Location of Seeding

Symbol for Turf Seed Mixture	Soil Type	General Location	Rate of Seeding lbs/ac (kg/ha)
TDS	Dry Sandy to Sand Loam	Rural or Urban	250 lbs/acre
TUF	All Types	Urban Freeway, Blvds, City Streets	250 lbs/acre
TGM	Medium to Heavy	All	250 lbs/acre
THM	Loamy to Heavy	Home and Business Turf	250 lbs/acre

C. Hydroseed with a blend of seed, fertilizer, and hydromulch.

2.02 MULCHING MATERIAL

A. Straw:

1. Small grain straw or grass or marsh hay acceptable to the Engineer.

B. Wood Excelsior:

1. Green wood fibers, baled or blanket of type and manufacture acceptable to the Engineer.
2. Make wood excelsior from green timber fiber, baled to weigh 80 to 90 pounds at the time of manufacture.
3. Make wood excelsior blankets from a uniform web of interlocking fibers with a backing of fabric netting on one (1) side only. Ensure the fabric net has a mesh size not exceeding 1-1/2 x 3 inch and is woven from cotton cord, twisted paper cord, or a synthetic, biodegradable fiber.
4. Produce blankets in the form of a tightly compressed roll 36 ±1 inch wide and approximately 120 feet long. Ensure the blanket has a fiber net on the outside of the fiber mat.
5. Ensure the blanket roll weight, when manufactured, averages 85 lbs ± 10%.
6. Place separator sheets of 40-pound Kraft paper at the beginning and end of each roll to facilitate unrolling and handling at the job site. Ensure the Kraft paper sheet at the end of each roll also forms a wrapper for the roll.

C. Netting:

1. Twisted Kraft paper or synthetic fiber, biodegradable woven mesh net material suitable for the application and acceptable to the Engineer.
2. Make the net from a biodegradable mesh with openings not exceeding 1-1/2 x 3 inch.
3. Furnish the net in widths of not less than 35 inches.

D. Proprietary Mulch Material:

1. Biodegradable natural and/or synthetic materials suitably fabricated and acceptable to the Engineer.

2.03 MULCH ANCHORING MATERIAL

A. Emulsified Asphalt:

1. ASTM D977, Rapid Setting (R.S. 1 or 2), Medium Setting (M.S. 2 or 2h) or Slow Setting (S.S. 1).

B. Mulch Anchoring Tool:

1. Suitable unit having a series of flat, notched discs for punching and anchoring mulch in soil, or a regular farm disc weighted and set nearly straight as a substitute.

C. Latex Base Adhesive:

1. Latex base adhesive mixed with water at a 25 to1 ratio of water to adhesive with 25 lbs of recycled newsprint as a tracer.

D. Recycled Newsprint:

1. Mix 7 lbs of newsprint with 7 gallons of water.

E. Guar Gum:

1. Mix 1 lb of dry adhesive with 26.5 gallons of water with 5 lbs of recycled newsprint as a tracer.

2.04 FERTILIZER

A. Use a standard commercial grade fertilizer, conforming to state regulations, of the type recommended for grasses. Ensure the fertilizer contains slow-release nitrogen amounting to 75% of the nitrogen available.

B. Ensure the fertilizer is uniform in composition, free-flowing, and suitable for application with the selected method.

C. Use fertilizer for hydraulic seeding that is soluble or ground to a fineness that permits complete suspension of all insoluble particles in the slurry.

2.05 AGRICULTURAL LIMING MATERIALS

A. Ensure burnt lime (quick lime), hydrated lime, limestone (calcite and dolomite), marble shells, and by-products conform to the requirements of ASTM C602.

2.06 WATER

A. Free of matter harmful to plant growth.

2.07 STAPLES

A. Use wire staples for holding mulching materials in place that are no less than 6 inches long, made of No. 11 (U.S. Steel Gage) steel wire or longer.

2.08 TOPSOIL

A. Use fertile, friable, sandy clay loam topsoil without admixture of subsoil. Ensure topsoil is free of glass, stones greater than 1 inch in any dimension, weeds, undesirable grasses, and other extraneous materials. Ensure the topsoil meets the following range of values:

Quality Parameter	**Range of Value**
Soil pH	5.0 to 7.5
Soluble Salts	500 ppm max
organic content	5 to 30 %
silt content	35% to 50%
clay content	5% to 10%
USDA Soil Classification	Loam or Sandy Loam
deleterious mat'l*	5% max
*rocks, gravel, stones, sticks, roots, sod, etc	

B. Compost may be mixed with topsoil to obtain the desired content. Topsoil is to be final screened thru a 5/8 inch maximum mesh screen prior to delivery to the Project site.

C. Have the Engineer review the source and final screen results prior to the release of topsoil.

D. Submit a certified analysis of the topsoil from each source to the Engineer.

E. Place topsoil in a minimum thickness of 3 inch throughout, or as specified in the Plans or Specifications.

F. Obtain the topsoil borrow pit source and secure all necessary permits and agreements for the use of such borrow pits at the Contractor's expense.

2.09 IMPROVED TOPSOIL

A. Make improved topsoil from a mixture of 2/3 topsoil and 1/3 compost. Ensure the mixture has a dark brown or black color, is capable of supporting plant growth without ongoing addition of fertilizers or other soil amendments, and has no objectionable odor.

2.10 COMPOST

A. Use mature/stabilized, humus-like compost derived from the aerobic decomposition of yard waste (i.e., grass clippings and leaves) or other designated compostable materials, in compliance with all federal and state laws. Ensure the mixture is free of objectionable odors, glass, plastic, metal, and other contaminants, as well as viable weed seeds and other plant parts capable of reproducing. Handle the mixture so that no visible water or dust is produced.

B. Ensure the manufacturer of the compost maintains annual test data and a statement on file with the Michigan Department of Agriculture, Pesticide and Plant Pest Management Division, showing that the following criteria are met by the compost provided for the project.

C. Ensure the composition of the compost falls within the following range of values:

Quality Parameter	Range of Value
Soil pH	6 to 7.5
Soluble Salts	2 to 5 mmho/cm
Carbon/Nitrogen Ratio	13 to 20 parts Carbon to 1 part Nitrogen
Inerts	< 1%
Organic matter	35 to 55 %
Nitrogen	1 to 2 %
Phosphorus	0.2 to 0.8 %
Potassium	0.5 to 1.5 %
Unit Weight	535 to 775 Kg/m3
Moisture Content	40 to 50 %
Particle Size	< 20 mm maximum
Water Holding Capacity	> 100%
Heavy Metals	None

1. Maturity/Stabilization: An acceptable test that can demonstrate Maturity/Stability.

2. Temperature: The compost material must have undergone the procedure to significantly reduce the pathogen level as referenced in EPA 40 CFR, Part 257 Regulations, Federal Register Vol. 58, No. 32, dated 2/19/93; Rules and Regulations. The temperature must be maintained at 40° C for 5 days with a temperature exceeding 55°C for at least 4 hours.

3. Pathogens and Trace Elements: Meet the requirements of EPA 40 CFR; Part 503 Regulations, Federal Register Vol. 58, No. 32, dated 2/19/93; Rules and Regulations.

4. Certify that the compost meets EPA 40 CFR, Part 257 and 503 Regulations, Federal Register Vol. 58, No. 32, dated 2/19/93, Rules and Regulations, to comply with the annual filing requirements.
5. Include a data sheet with the certification.
    a. Ensure the data sheet shows the following:
    b. Standard compost total nutrient test results, including N, P, K, Ca, Mg, Mn, Cu, Fe total carbon, pH, as provided by an acceptable testing laboratory
    c. Organic content
6. Inert contamination
    a. Soluble salts
    b. Carbon/Nitrogen ratio
    c. Proof of maturity/stability acceptable to the Michigan Department of Agriculture

PART 3 EXECUTION

3.01 PREPARATION OF SUBGRADE

A. Complete all fine grading within the areas to be covered with topsoil necessary to bring the surface of the proposed subgrade to the elevations indicated on the Plans and parallel to the proposed finished grade.

B. Rake or loosen the surface of the subgrade immediately prior to covering with topsoil to a minimum depth of 2 inch to facilitate bonding between the subsoil and topsoil.

3.02 PREPARATION OF SOIL

A. Bring the existing soil to a friable condition by harrowing or loosening and mixing to a depth of at least 4 inches after the areas to be seeded have been brought to the required grade and properly trimmed and cleaned up.

B. Thoroughly break lumps and clods. If the area to be seeded has been prepared and covered with a layer of topsoil as specified under Part 3 of this Section, this operation is not required.

3.03 PREPARATION OF MULCH MATERIAL

A. Prepare the mulched area for seeding by discing, using a spike-toothed harrow, or by other means acceptable to the Engineer when the seed is to be sown through mulch that has been in place for more than two (2) weeks or is held in place by a surface-applied coating of asphalt emulsion or other adhesive.

3.04 PLACING AND SPREADING TOPSOIL

A. Place and spread topsoil over the area designated on the Plans, or as determined by the Engineer, to a depth of 4 inches or to the depth specified on the plans.

B. Place topsoil to a depth sufficiently greater than that shown on the Plans or specified, so that, after natural settlement or rolling, the completed Work conforms to the lines, grades, and elevations shown on the Plans.

C. Complete the spreading of topsoil in a manner that allows seeding to proceed without additional moving of topsoil. Consider topsoil furnished and placed as incidental to seeding unless otherwise specified in the Proposal.

D. Rake and remove large earth lumps, rocks, roots, debris, or other foreign matter from the topsoiled area and legally dispose of them.

3.05 FERTILIZING

A. Apply chemical fertilizer to the prepared soil surfaces at a minimum rate of 660 lbs per acre of 12-12-12 fertilizer, or at such other rate of another fertilizer mixture that yields 240 lbs per acre of chemical nutrient.

B. Disc, harrow, or rake dry fertilizers thoroughly into the soil to a minimum depth of not less than 1 inch.

C. When hydraulic seeders are used for sowing seed, spread one-half of the recommended rate of fertilizer in combination with the sowing, and incorporate the balance into the soil prior to seeding. In all other cases, incorporate fertilizer into the soil before starting any seeding.

3.06 SEEDING

A. Sow seed at the rate specified in Table 2. Seed the area in the presence of an inspector using a mechanical spreader, hydraulic seeder, or broadcasting. Use the broadcasting method only in areas inaccessible to mechanical spreading equipment. Do not seed during winds above 15 mph.

B. Water topsoil to a depth of 4 inches at least 48 hours prior to seeding operations to obtain a loose, friable seed bed. Vary the time and depth of watering operations as directed by the Engineer to accommodate varying site conditions.

C. Broadcast seed materials by spreading one-half of the specified amount of seed in one direction, then broadcast the remaining one-half of the seed at right angles to the first seeding pattern using the same broadcast method.

D. Broadcast at the rate specified herein or per the written recommendations of the Producer of the seed material used.

E. Roll seeded area with roller weighing a maximum of 150 lbs per foot of width.

F. Perform hydroseeding using suitably acceptable hydraulic seeding equipment and a homogeneous slurry solution of water, seed, fertilizer, and suitable mulch material as approved by the Engineer. Distribute the seed slurry mixture uniformly at a rate approved by the Engineer for the seeding and/or mulch materials used to suit the seed application rate. Apply seed at a rate of 300 lbs per acre.

3.07 MULCHING

A. Place mulch material on areas that have been or are to be seeded. Ensure the mulch is placed loosely enough to allow sunlight penetration and air circulation, but thick enough to shade the ground, reduce water evaporation, and prevent erosion by wind or water. Secure the mulch with suitably acceptable anchoring material.

B. For surfaces and slopes on which power equipment can be operated, satisfactory mulching materials include the following:

1. Small grain wheat straw or grass hay applied at 1-1/2 to 2 tons per acre with disc packer, asphalt or netting tie-down.
2. Wood chips applied at 6 to 9 tons per acre.
3. Asphalt emulsion alone at 600 to 1200 gallons per acre. (This application is suitable for limited periods of time and where trampling by either people or animals will not occur.)

C. For surfaces and slopes where power equipment cannot be operated, satisfactory mulching materials include the following:

1. Straw or grass hay applied at 1-1/2 to 2 tons per acre, anchored with asphalt or netting tie-down.
2. Asphalt emulsion alone at 600 to 1200 gallons per acre. (Limited to areas where tracking is not a problem.)

D. Anchor straw or hay mulch by the methods as specified herein.

E. Wood chips will not need anchoring when used on workable slopes.

F. Anchor commercially manufactured netting and/or fiberglass materials according to the manufacturer's printed instructions for the material used.

G. Punch and anchor mulch material into soil using mulch anchoring tool. Soil must be moist, free of stones and loose enough to permit disc penetration to a depth of 3 inches.

H. Blow on liquid or emulsified asphalt materials with the straw or hay mulch or spray or sprinkle asphalt tie-down materials immediately after mulch is spread.

1. Apply emulsified asphalt at 200 gal per acre.
2. Do not apply emulsified asphalt during freezing weather since it contains approximately 50% water.
3. Apply liquid (cut back) asphalt at approximately 485 gal per acre.

3.08 CONVERSION FROM SOIL PROTECTION TO PERMANENT VEGETATION

A. Following straw or hay mulching, grass seeding can be made in early spring by broadcasting seed directly into the mulch. Fertilizer or lime, where needed, should be incorporated into the soil before mulching.

B. Asphalt emulsion alone can be readily incorporated into the soil by ordinary tillage before seeding.

C. Wood chip mulch may be removed before seeding or incorporated deeply into the soil. If wood chips are incorporated into the soil, the addition of extra nitrogen fertilizer to the soil will be required to provide nitrogen in the new seeding.

D. Remove fiberglass mulch before seeding due to its permanence. Take care to prevent fiberglass filaments from becoming entwined or wound around shafts of power mowers or other power equipment.

E. Dispose of acceptable proprietary netting and erosion control materials in accordance with the manufacturer's printed instructions for the material used, prior to any seeding operations.

3.09 TURF ESTABLISHMENT

A. Water seeded areas whenever excessive drying is evident during the establishment period. Water in a manner that prevents erosion from excessive quantities, and ensure the watering equipment is of a type that prevents damage to the cultivated surfaces.

B. Take responsibility for the proper care of the seeded areas until final acceptance of the entire Work covered by the Contract.

C. Mow the seeded areas with mowing equipment acceptable to the Engineer to a height of 2 inches whenever the average grass height reaches four 4 inches. Remove cut grass when the amount is heavy to prevent destruction of the underlying grass.

D. Mow or, in the case of rank growths, uproot, rake, and legally dispose of weeds or other undesirable vegetation that threaten to smother the planted species.

E. Reseed and mulch areas larger than 4 sq inches not having a dense, uniform, vigorous stand of grass acceptable to the Engineer.

F. Extend the establishment period from the time of seeding until the seeded area has a uniform stand of grass acceptable to the Engineer. The minimum period is 30 days.

G. If after 60 days from the initial seeding a dense, uniform, vigorous stand of grass has not been established by the Contractor, the Owner may reseed the defective areas and all costs will be deducted from the Contractor’s payments.

END OF SECTION