

TECHNICAL SPECIFICATIONS

Livonia Public Schools Central Office Pavement – Phase II

Livonia Public Schools
15125 Farmington Road
Livonia, MI 48154

January 2025
NTH Project #: 23001951



NTH Consultants, Ltd.
41780 Six Mile Rd.
Suite 200
Northville, MI 48168



DOCUMENT 00 01 10

TABLE OF CONTENTS

Livonia Public Schools Bid Announcements and Documents

AIA Document A105-2017

Page No.

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

DOCUMENT 00 0110	Table of Contents	00 0110-1 thru 3
DOCUMENT 00 0115	List of Drawings	00 01 15-1
DOCUMENT 00 2113	Instructions to Bidders	00 21 13-1 thru 8
DOCUMENT 00 4113	Bid Form	00 41 13-1 thru 9
DOCUMENT 00 4115	“No Bid” Response Form	00 41 15-1

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 2200	Unit Prices	01 22 00-1 thru 3
SECTION 01 3000	Administrative Requirements	01 30 00-1 thru 9
SECTION 01 4000	Quality Requirements	01 40 00-1 thru 7
SECTION 01 5000	Temporary Facilities and Controls	01 50 00-1 thru 3
SECTION 01 5100	Temporary Utilities	01 51 00-1 and 2
SECTION 01 5713	Temporary Erosion and Sediment Control	01 5713-1 thru 7
SECTION 01 6000	Product Requirements	01 60 00-1 thru 4
SECTION 01 7000	Execution and Closeout Requirements	01 70 00-1 thru 10
SECTION 01 7419	Construction Waste Management and Disposal	01 74 19-1 thru 6



DIVISION 03 - CONCRETE

SECTION 03 2000	Concrete Reinforcement	03 20 00-1 thru 4
-----------------	------------------------	-------------------

DIVISION 31 - EARTHWORK

SECTION 31 1000	Site Clearing	31 10 00-1 thru 8
SECTION 31 2200	Grading	31 22 00-1 thru 3
SECTION 31 2313	Subgrade Preparation	31 23 13-1 thru 3
SECTION 31 2316	Excavation	31 23 16-1 thru 7
SECTION 31 2323.13	Soil Backfilling	31 23 23.13-1 thru 6
SECTION 31 2323.23	Compacting	31 23 23.23-1 thru 3

DIVISION 32 - EXTERIOR IMPROVEMENTS

SECTION 32 1123	Aggregate Base and Surface Courses	32 11 23-1 thru 5
SECTION 32 1213	Bond Coats	32 12 13-1 thru 2
SECTION 32 1216	Asphalt Paving	32 12 16-1 thru 7
SECTION 32 1313	Concrete Pavement	32 13 13-1 thru 19
SECTION 32 1373	Pavement Joint Sealants	32 13 73-1 thru 5
SECTION 32 1713	Parking Bumpers	32 17 13-1 and 2
SECTION 32 1723.13	Painted Pavement Markings	32 17 23.13-1 thru 7
SECTION 32 9000	Site Restoration	32 90 00-1 thru 5



DIVISION 33 - UTILITIES

SECTION 33 4600	Underdrainage	33 4 600-1 thru 5
-----------------	---------------	-------------------

APPENDIX

APPENDIX A	Central Office Geotechnical Investigation	Pages 1 through 36
APPENDIX B	Franklin HS Geotechnical Investigation	Pages 1 through 23
APPENDIX C	Central Office Underground Utilities	Pages 1 through 4
APPENDIX D	City of Livonia Soil Erosion Worksheet	Page 1

END OF DOCUMENT



DOCUMENT 00 01 15

LIST OF DRAWINGS

The following drawings dated 1/29/2025, accompany and form a part of the Contract Documents:

Livonia Public Schools 2025 Paving Program: Central Office Phase 2

<u>Sheet Number</u>	<u>Title</u>
Sheet C-100	Cover Sheet
Sheet C-101	Topographic Survey (By Others)
Sheet C-102	Pavement Sequencing Plan
Sheet C-103	Soil Erosion and Sedimentation Control Plan
Sheet C-104	Soil Erosion and Sedimentation Control Standard Details
Sheet C-105	Demolition Plan
Sheet C-106	Proposed Site and Grading Plan
Sheet C-501	Civil Details

Livonia Public Schools 2025 Paving Program: Franklin High School

<u>Sheet Number</u>	<u>Title</u>
Sheet C-100	Cover Sheet
Sheet C-101	Topographic Survey (By Others)
Sheet C-102	Soil Erosion and Sedimentation Control Plan
Sheet C-103	Soil Erosion and Sedimentation Control Standard Details
Sheet C-104	Demolition Plan
Sheet C-105	Proposed Site and Grading Plan

Livonia Public Schools 2025 Paving Program: Bentley Field Track Resurfacing

<u>Sheet Number</u>	<u>Title</u>
Sheet C-100	Cover Sheet
Sheet C-101	Site Plan

END OF DOCUMENT



DOCUMENT 00 21 13

INSTRUCTIONS TO BIDDERS

ARTICLE 1 - DEFINITIONS

- 1.1 Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Livonia Public Schools Bid Advertisement, Invitation to Bid, Instructions to Bidders, Bid Form, and other bidding and contract documents provided in Division 00.
- 1.2 Addenda are written or graphic instruments issued by the Engineer and Livonia Public Schools (LPS) prior to the execution of the Contract and which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.
- 1.3 A bid is a complete and properly signed proposal to do the Work for the Lump Sums stipulated therein, submitted in accordance with the Bidding Documents.
- 1.4 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids.
- 1.5 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.
- 1.6 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services or a portion of the Work as described in the Bidding Documents.
- 1.7 The term “Company”, as used in the Contract Documents, means “Livonia Public Schools”.
- 1.8 The term “Final Completion”, means when the Contractor is 100% complete with the Work and all required post-construction submittals.



ARTICLE 2 - PROJECT INFORMATION

- 2.1 Project Name: Livonia Public Schools 2025 Paving Program
- 2.2 Project Locations: Central Office
15125 Farmington Rd.
Livonia, Michigan 48150
- Franklin High School
31000 Joy Rd.
Livonia, Michigan 48150
- Bentley Field Track
15125 R Joy Rd.
Livonia, Michigan 48154
- 2.3 Project Description: Asphalt pavement reconstruction and repairs
Site re-grading
- 2.4 Owner's Representative: Mr. Harry C. Lau
Livonia Public Schools
15125 Farmington Road
Livonia, Michigan 48154
Phone: 734.744.2511
Email: hlau@livoniapublicschools.org
- 2.5 Engineer: NTH Consultants, Ltd.
41780 Six Mile Rd., Suite 200
Northville, Michigan 48168
Project: David Lutz, P.E.
Phone: 248.662.2750
Email: dlutz@nthconsultants.com

ARTICLE 3 - BIDDER'S REPRESENTATIONS

- 3.1 By making a Bid, the Bidder represents that:
- 3.1.1 The Bidder has read and understands the Bidding Documents and the Bid is made in accordance therewith.
- 3.1.2 The Bidder has visited the site, become familiar with local conditions under which the Work is to be performed and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents.



- 3.1.3 The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception.

ARTICLE 4 - BIDDING DOCUMENTS

- 4.1 In making copies of the Bidding Documents available, LPS and the Engineer do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant permission for any other use of the Bidding Documents.
- 4.2 The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall at once report to the Engineer and LPS errors, inconsistencies or ambiguities discovered.
- 4.3 Bidders requiring clarification or interpretation of the Bidding Documents shall make a written request, which shall reach the Engineer and Livonia Public Schools at least four (4) days prior to the date for receipt of Bids. Specifically, general, commercial, and technical questions shall be electronically forwarded to Livonia Public School's Representative and all questions shall be electronically copied to the Engineer.
- 4.4 Interpretations, corrections and changes of the Bidding Documents will be made by Addendum. Interpretations, corrections, and changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon them.
- 4.5 The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.
- 4.6 No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Engineer and LPS at least ten (10) days prior to the date for receipt of Bids. Such requests shall be in the format defined in Specification Section 01 6000. The burden of proof of the proposed substitution's merit is upon the proposer. The Engineer and LPS shall make the decision of approval or disapproval of a proposed substitution, which shall be final.
- 4.7 Substitutions approved prior to receipt of Bids will be identified in an Addendum. Bidders shall not rely upon approvals made in any other manner. No substitutions will be considered after the Contract award unless specifically provided in the Contract Documents.
- 4.8 Addenda will be emailed to all who are known by the issuing office to have received a complete set of Bidding Documents. Addenda will also be posted on Bidnet Direct, and on the Livonia Public Schools website.



- 4.9 No Addenda will be issued later than two (2) days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.
- 4.10 Prior to submitting a Bid, each Bidder shall ascertain that all issued Addenda have been received. The Bidder shall acknowledge receipt of the Addenda in the Bid.

ARTICLE 5 - PRE-BID INFORMATION

- 5.1 A pre-bid conference will be held at the project site. At that time, site conditions may be examined and the Engineer and LPS will be available to answer questions.
- 5.2 Bidder must demonstrate to the satisfaction of LPS that he has adequate equipment, personnel, experience, and understanding of the specifications to perform service under the contract.
- 5.3 No contract will be awarded to a bidder who, in the opinion of LPS, is not qualified to perform satisfactorily due to previously unfavorable performance, reputation, or lack of experience, capital, organization, equipment, and/or personnel to conduct and complete the services in accordance with the terms and conditions of the contract.
- 5.4 LPS may make such investigations as they deem necessary to determine the ability of the Bidder to perform the work, and the Bidder shall furnish to LPS all such information and data for this purpose as LPS may request. LPS reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy LPS that such bidder is properly qualified to carry out the obligations of the agreement and to complete the work contemplated therein.

ARTICLE 6 - BIDDING PROCEDURES

- 6.1 Bids shall be submitted on forms identical to the form included with the Bidding Documents. All blanks on the Bid Form shall be filled in ink. Interlineations, alterations, and erasures must be initialed by the signer of the Bid. Submitted bids shall be based solely on the materials and construction described in the Bidding Documents. The bid shall include the premiums or costs for the insurance coverage required in the Contract Documents.
 - 6.1.1 The successful Bidder may be required to furnish a Performance Bond and/or Labor and Material Payment Bond. Include the premiums and other charges for such costs as Alternates in the Bid, complying with the laws of the State of Michigan, for the total Base Bid amount as calculated at the time the bids are received. Performance Bond and Labor and Material Payment Bond shall be from a surety acceptable to LPS and made payable as follows:



- (1) A bond for the formula amount of the Base Bid running to LPS and guaranteeing the payment of all subcontractors and all indebtedness incurred for labor, materials, or any causes whatsoever on account of the Contractor in accordance with the laws of the State of Michigan relating to such bonds.
 - (2) A bond for the formula amount of the Base Bid running to the Livonia Public Schools to guarantee and insure the completion of work according to the Contract.
- 6.2 All items quoted shall be "F.O.B. Destination". No additional freight charges will be allowed.
- 6.3 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change".
- 6.4 The bidder may, during the bidding period, be advised by Addendum of changes to the Contract Documents. Such changes are included in the Work and become part of the Contract Documents. List each Addendum by number in the space provided on the Bid Form.
- 6.5 Bidders must satisfy themselves of the accuracy of the estimated quantities in the Bid form by examination of the site and review of the bid documents. After bids have been submitted, the Bidder shall not assert that there was a misunderstanding concerning the quantities of work, or of the nature of the work to be done.
- 6.6 Submitted Bids shall include a Subcontractor Listing (names of persons or entities, including those who are to furnish materials or equipment fabricated to a special design, proposed for the principal portions of the Work). Sub-contractors must adhere to the same requirements as the prime contractors.
- 6.7 LPS is committed to utilizing Michigan based vendors and contractors as sub-vendors and subcontractors to the successful Bidder for this consideration. The vendor or contractor's W9 must list a Michigan address. This is LPS criterion for determining if a vendor or contractor is a Michigan based company. To that end, the Bid Form shall indicate whether each proposed sub-vendor or subcontractor is a Michigan based company.
- 6.8 Each copy of the Bid shall include the legal name of the Bidder and a statement that the Bidder is a sole proprietor, partnership, corporation, or other legal entity. Each copy shall be signed in ink on the designated signature line by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.



- 6.9 Each Bidder shall pledge that the Bidder will enter into a Contract with LPS on the terms stated in the Bid and will, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.
- 6.10 Submit bids as described in the Livonia Public Schools Invitation to Bid. Submission should include the completed Document 00 4113 – Bid Form.
- 6.11 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids. Oral, telephonic, or telegraphic Bids are invalid and will not be considered.
- 6.12 A Bid may not be modified, withdrawn, or canceled by the Bidder until after 180 days following the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting a Bid.
- 6.13 Prior to the date and time designated for the receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder or by telegram; if by telegram, written confirmation over the signature of the Bidder shall be mailed and postmarked on or before the date and time set for receipt of Bids. A change shall be so worded as not to reveal the amount of the original Bid.
- 6.14 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids, provided that they are fully in conformance with these Instructions to Bidders.
- 6.15 Bidders who are unable or unwilling to submit a bid should complete and return Document 00 4115 to LPS and the Engineer electronically by the bid due date and time.
- 6.16 All Bids and material that accompanies the Bid becomes the property of LPS and will not be returned to the Bidder unless an agreement in writing is secured before the Bid is submitted.
- 6.17 No interpretation of the meaning of the plans, specifications, or other Bid documents will be made to any bidder orally. Every request for such interpretation shall be in writing addressed to the Engineer and LPS. To be given consideration, requests for interpretations must be received at least four (4) days prior to the date fixed for the opening of Bids. Any and all such interpretations and supplemental instructions will be in the form of written Addenda to the Bid Documents. Failure of a Bidder to receive such Addendum or interpretation shall not relieve such Bidder from any obligation under his/her bid as submitted. All Addenda so issued shall become part of the Contract Documents.

ARTICLE 7 - CONSIDERATION OF BIDS

- 7.1 LPS shall maintain the following rights in its sole and exclusive discretion:



- 7.1.1 To terminate or modify this Request for Proposal (RFP) at any time without liability or obligation to any prospective Bidder or actual Bidder.
- 7.1.2 To reject any and all Bids; or any portion thereof.
- 7.1.3 To reject any and all Bids not accompanied by a required bid security or by other data required by the Bidding Documents or reject a Bid that is in any way incomplete or irregular.
- 7.1.4 To not award any contract subsequent to this RFP.
- 7.1.5 To enter into any agreement that LPS deems appropriate at any time before, during or after this RFP process is complete.
- 7.1.6 Alternate Bids will not be considered unless a Base Bid, as specified herein, is submitted.
- 7.1.7 Partial or incomplete Bids will not be considered.
- 7.1.8 Bids received later than the date and time listed are normally rejected.
- 7.1.9 LPS reserves right to award any contract subsequent to this RFP to other than the low bidder based upon LPS' sole discretion.
- 7.2 It is the intent of LPS to award a Contract to the lowest qualified, responsible Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. Consideration will be given to several factors, including but not limited to the experience of the Bidder and major subcontractors (if applicable), the Bid amount and schedule.
- 7.3 In the case of a discrepancy in the extension of a unit price, the unit price shall govern the total price.

ARTICLE 8 - POST-BID INFORMATION

- 8.1 The Bidder will be required to establish, to the satisfaction of the Engineer and LPS, the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.
- 8.2 Prior to the award of the Contract, the Engineer and LPS will notify the Bidder in writing if LPS, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. LPS may accept the adjusted bid price or disqualify the Bidder. In the event of withdrawal or disqualification, bid security will not be forfeited.



- 8.3 Persons and entities proposed by the Bidder and to whom LPS have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of LPS.

END OF DOCUMENT



DOCUMENT 00 41 13

BID FORM

PROJECT: Livonia Public Schools 2025 Paving Program

OWNER'S REPRESENTATIVE:

Mr. Harry C. Lau
Livonia Public School
15125 Farmington Road
Livonia, Michigan 48154
Phone: 734.744.2511

ENGINEER:

Mr. David R. Lutz, P.E.
NTH Consultants, Ltd.
41780 Six Mile Road, Suite 200
Northville, Michigan 48168
Phone: 248.662.2750

NAME OF BIDDER:

ADDRESS OF BIDDER:

CONTACT NAME:

CONTACT TELEPHONE:

FAX NO.:

EMAIL ADDRESS:

BID DUE: See the Livonia Public Schools Bid Announcement Documents



1. BID AMOUNTS

The undersigned, having familiarized himself with all local conditions to be encountered affecting the cost of the work and examined the contract documents dated, prepared by NTH Consultants, Ltd., does hereby propose to furnish all labor, materials, equipment, supervision, and necessary services to complete the work for the above project. All work is to be performed in accordance with the contract documents including any addenda noted herein. The cost of all work covered by the following addenda is included in the lump sum price of this proposal.

Addendum No. _____ Date _____

Addendum No. _____ Date _____

Addendum No. _____ Date _____

Quantities indicated in this Bid Form and on the Drawings are for informational purposes. **Contractor is to verify all quantities and complete ALL WORK SHOWN OR DESCRIBED ON THE DRAWINGS UNDER THE LUMP SUM AMOUNT.** Charges for over excavation of pavement sections due to poor subgrade support will be paid on a unit cost basis.

LPS may award each school to different bidders or may award multiple schools to one bidder.

A. Base Bid

1. **Central Office Phase 2:** The scope of work is indicated on the contract drawings and specifications. The scope includes, but is not limited to, the following:
 - a. 79,000 square feet of full depth, heavy duty asphalt pavement removal and replacement patchwork.
 - b. 59,000 square feet of full depth, standard duty asphalt pavement removal and replacement patchwork.
 - c. Installation of concrete box outs and drain tiles around existing drainage structures, and repair of existing concrete box outs where necessary. Installation of 6 concrete box outs in 2024 Central Office Phase I area.
 - d. All City of Livonia Engineering Permits, Fees, Bonds, Insurance (Public Right-of-Way/Easements) and all Performance and Bid Bonds (All Refundable fees must be credited to Livonia Public Schools).
 - e. The contractor is responsible for verifying field measurements associated with the work and all quantities listed above, and ensuring all work shown on the drawings is included in the bid amount.



B. Bid Alternates

1. **Franklin High School:** The scope of work is indicated on the contract drawings and specifications. The scope includes, but is not limited to, the following:
 - a. 76,600 square feet of full depth removal & replacement (standard duty asphalt)
 - b. All City of Livonia Engineering Permits, Fees, Bonds, Insurance (Public Right-of-Way/Easements) and all Performance and Bid Bonds (All Refundable fees must be credited to Livonia Public Schools).
 - c. The contractor is responsible for verifying field measurements associated with the work and all quantities listed above, and ensuring all work shown on the drawings is included in the bid amount.
2. **Bentley Field Track Resurfacing:** The scope of work is indicated on the contract drawings and specifications. The scope includes, but is not limited to, the following:
 - a. 44,000 square feet of a 2-inch asphalt pavement mill and overlay.
 - b. Installation of new track lane striping.
 - c. The contractor is responsible for verifying field measurements associated with the work and all quantities listed above, and ensuring all work shown on the drawings is included in the bid amount.

C. Allowances

- a. Provide for \$25,000 allowance in Base Bid to be used only with prior written approval of the Owner for unforeseen conditions or field modifications.
- b. Provide for \$50,000 allowance in Base Bid to be used only with prior written approval of the Owner for excavation and replacement of additional aggregate base and subgrade soils.
- c. Provide allowance for excavation of subgrade material to a maximum depth of 18-inches below the bottom of the pavement profile and replacement with compacted MDOT 21AA for up to 13,800 square-feet of full-depth replacement area of the Central Office location and up to 800 square-feet of the Franklin High School Bid Alternate.

Base Bid: The above-named Bidder hereby proposes to perform the entire Base Bid work at the Central Office in accordance with the bidding documents for the lump sum (including All City of Livonia Engineering Permits, Fees, Bonds, Insurance, all Bid Bonds, all Performance Bonds, and Allowance) of:



_____dollars

(\$_____) which constitutes the Base Bid.

- **Bid Alternate 1** add for Franklin High School: \$ _____
- **Bid Alternate 2** add for Bentley Field Track: \$ _____

Bid Bond: The above-named Bidder hereby proposes to provide bid bonds for base bid work at the Central Office in accordance with the bidding documents as follows:

Bid Bond Amount: \$ _____

Performance Bond: The above-named Bidder hereby proposes to provide performance bonds for base bid work at the Central Office in accordance with the bidding documents as follows:

Performance Bond Amount: \$ _____

B. Proposed Base Bid Schedule

1. The above-named Bidder hereby proposes to perform the entire Base Bid work at the Central Office in accordance with the bidding documents from site mobilization to demobilization in:

_____ Calendar Days

C. Proposed Alternate Bid Schedule

1. The above-named Bidder hereby proposes to perform the entire Alternate Bid work at Franklin High School in accordance with the bidding documents from site mobilization to demobilization in:

_____ Calendar Days

2. The above-named Bidder hereby proposes to perform the entire Alternate Bid work at Bentley Track in accordance with the bidding documents from site mobilization to demobilization in:

_____ Calendar Days



2. UNIT PRICES

For repair quantities less than or in excess of ten percent of the quantities listed in part A and B above, Livonia Public schools may add or deduct from the base bid or alternate based on the unit prices provided below.

Item No.	Unit Price Description	Drawing Reference	Unit	Unit Cost
1	Remove and dispose of 3-inch to 9-inch asphalt pavement	Detail 1	SF	\$
2	Remove and dispose 9-inch to 18-inch of gravel/subbase materials	Detail 1	SF	\$
3	Provide 1.5-inch MDOT, HMA 4C/5EML/4EML, PG64-22 asphalt wearing course	Detail 2A	SF	\$
4	Provide 2-inch MDOT, HMA 3C/4EML, PG64-22 asphalt leveling course	Detail 2A	SF	\$
5	Provide 2.0-inch MDOT, HMA 3C, PG64-22 asphalt base course	Detail 2A	SF	\$
6	Provide 1.5-inch MDOT, HMA 4C/5EML/4EML, PG64-22 asphalt wearing course	Detail 2B	SF	\$
7	Provide 2.5-inch MDOT, HMA 3C/4EML, PG64-22 leveling course	Detail 2B	SF	\$
8	Provide 6-inch MDOT 21AA limestone aggregate base course in pavement reconstruction areas	Detail 2A/2B Detail 1 (Bid Alternate 1 Sheet C-107)	CY	\$
9	Provide 1.5-inch MDOT, HMA 13A/36A EL PG58-28 asphalt wearing course	Detail 1 (Bid Alternate 1 Sheet C-107)	SF	\$
10	Provide 2.5-inch MDOT, HMA 13A EL PG58-28 asphalt leveling course	Detail 1 (Bid Alternate 1 Sheet C-107)	SF	\$
11	Provide 2-inch mill and overlay with HMA 4C/5EML/4EML, PG64-22 asphalt wearing course	Detail 1 (Bid Alternate 2 Sheet C-101)	SF	\$
12	Provide butt joint	Detail 3	LF	\$
13	Provide sawcut control joint	Detail 6	LF	\$
14	Provide isolation joint	Detail 7	LF	\$



Item No.	Unit Price Description	Drawing Reference	Unit	Unit Cost
15	Provide 8-foot by 8-foot concrete box-out and underdrain	Detail 8	EA	\$
16	Provide full depth (3-inches to 9-inches) asphalt saw cutting	N/A	LF	\$
17	Provide full depth (6-inches to 10-inches) concrete saw cutting	N/A	LF	\$
18	Provide pavement striping and stenciling	Detail 10 & Sheet C-106 Pavement Marking Table (Bid Alternate 1 Sheet C-105 detail 4 and Pavement Marking Table)	LS	\$
19	Provide and install concrete bumper block (8' x 8'' x 8'')	Detail 12	EA	\$
20	Remove and dispose of contaminated materials (asphalt/concrete/aggregate base/soils)	N/A	CY	\$
21	Remove and dispose of hazardous materials (asphalt/concrete/aggregate base/soils)	N/A	CY	\$
22	Over excavation due to soft soils, includes geogrid and stone and/or asphalt milling backfill 12-inches below pavement section (aggregate base and asphalt)	Detail 4	SF	\$
23	Over excavation due to soft soils, includes geogrid and stone and/or asphalt milling backfill 18-inches below pavement section (aggregate base and asphalt)	Detail 4	SF	\$

3. SUBCONTRACTORS

The Bidder agrees to subcontract only for the following work and only to those Subcontractors named below:

Work Description	Subcontractor Name
<hr/>	<hr/>
<hr/>	<hr/>
<hr/>	<hr/>
<hr/>	<hr/>



4. SCHEDULE

A. **The anticipated construction schedule is as follows:**

a. **The Owner will provide a finalized time frame.**

- B. The Owner may utilize the parking areas to carry on normal business operations during construction. The Bidder shall schedule work with the Owner to minimize interference with these operations. Contractor bids shall include evening and weekend work to minimize operations.

5. INSURANCE

- A. The Bidder agrees to furnish insurance coverage in the amounts indicated in the Contract Documents.

6. GENERAL AGREEMENTS

- A. All employees (excluding material/equipment delivery personnel) on the project from the Contractor and all subcontractors must attend an on-site orientation and safety training meeting prior to the start of work. Estimated meeting time is 1 to 2 hours and shall be included in the lump sum Base Bid for each site.
- B. The Bidder understands that all removed materials, including but not limited to asphalt, concrete, stone base, and soils are to be disposed of in accordance with City, State, and Federal requirements.
- C. The Bidder understands that suspected contaminated/hazardous materials will be verified and tested by designated LPS staff. Contractor to coordinate with LPS staff on site. Materials found to be contaminated / hazardous are to be stockpiled on site and covered with visqueen in an area approved by the Company, unless requested to dispose offsite using contract unit prices. Stockpile location shall not interfere with existing traffic patterns or proposed detour routes.
- D. The Bidder agrees they have had an opportunity to examine the Site and Contract documents and have carefully prepared the Proposal upon the basis thereof. The Proposal, and materials, equipment, and labor required thereunder, and cost thereof, have been carefully examined and the Bidder hereby states that the amount, or amounts, set forth in this Proposal is, or are, correct and that no error has occurred in this Proposal or in the computations upon which this Bid is based.
- E. The Bidder acknowledges that this bid was developed without any collusion, undertaking, or agreement, either directly or indirectly, with any other Bidder or Bidders to maintain the prices of indicated work or prevent any other Bidder or Bidders from bidding the Work.



- F. The Bid will remain subject to acceptance for 90 days after the day of Bid opening. Bidder agrees to execute a contract, contingent upon receiving notification of selection of the Bid within 90 days of the date set for the opening thereof.
- G. The Bidder understands that LPS will not be liable for amounts in excess of the lump sum Bid, except as expressly stated in written Change Orders duly executed and delivered by the Company.
- H. The Bidder declares that in preparing this bid, they have assured themselves of the availability of all labor, materials, and products to meet the completion date.
- I. LPS has the right to reject the Bid.
- J. Bidder will sign and submit the Purchase Order with the Bonds (if required) and other documents required by the Bidding Requirements within 10 days after receipt.

7. OTHER REQUIREMENTS

- A. Bidder Experience Modification Rate (EMR) is: _____
- B. Provide T & M rates as an attachment to this Bid Form. In the event of “additional emerging work”, LPS will consider these rates. The provided T & M rates must be firm for the period of the agreement.
- C. The Bidder understands that underground utilities may be present at the location of the Work. The Contractor shall take all necessary precautions to work around existing utilities. Should an underground utility be hit, the Contractor is responsible for coordinating the relocation with the Owner or Owner's representative, at no additional cost to the Owner.
- D. Contractor must perform all work in accordance with the City of Livonia and Wayne County work requirements.
- E. Contractor will provide the full-time services of a competent superintendent to monitor all work from the start of the work to the date of final completion of the contract.
- F. Bidder proposed Superintendent: _____
- G. Proposed Superintendent years of experience in this role on similar projects:



- H. When directed by the Owner/Engineer, meetings will be held for the purpose of coordinating and expediting the work. The invited contractors or subcontractors will be required to have qualified representatives at these meetings, empowered to act in their behalf.
- I. Provide a staff adequate to coordinate and expedite the work properly. At all times, maintain competent supervision over all work activities to ensure compliance with contract requirements.
- J. The Contractor is solely responsible for all construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the work under the Contract.
- K. Coordinate all area closings with the Owner.
- L. Tenant access to sidewalks and buildings must be maintained at all times. Coordinate work location, staging areas, contractor parking, and any other contractor or work-related areas to not block tenant access.



ADDRESS, LEGAL STATUS AND SIGNATURE OF BIDDER

The undersigned Bidder does hereby designate the address given below as the legal address to which all notices, directions, or other communications may be served or mailed:

Name of Company _____
Street _____
City _____ State _____ Zip Code _____
Phone No. _____

The undersigned Bidder does hereby declare that the Bidder has the legal status checked below:

Sole Proprietorship
Partnership
Corporation incorporated under the
laws of the State of _____

The names and addresses of all persons indicated as Partners or as President, Secretary and Treasurer of a Corporation in this Bid are as follows:

Name	Address
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

This Bid is submitted in the name of:

Name of Contractor
Signed By: _____
Title: _____

Signed and sealed this _____ day of _____ 2025.

END OF DOCUMENT



DOCUMENT 00 41 15

“NO BID” RESPONSE FORM

Request for Proposal: Livonia Public Schools 2025 Paving Program

Owner: Livonia Public Schools

Project: Livonia Public Schools 2025 Paving Program

To submit a “No Bid” response for this project, complete this form and submit electronically to hlau@livoniapublicschools.com by the bid due date and time. Copy dlutz@nthconsultants.com on the electronic submission.

Please check statement(s) applicable to your “No Bid” response:

- ☐ Insufficient time to respond to this RFP.
- ☐ Our schedule would not allow us to perform.
- ☐ We are unable to meet bond requirements.
- ☐ We are unable to meet insurance requirements.
- ☐ We are unable to meet other contract requirements (explain below).
- ☐ Specifications are restrictive (i.e. geared toward one brand or manufacturer only (explain below).
- ☐ Specifications are ambiguous (explain below).
- ☐ We are unable to meet specifications.
- ☐ We do not offer this service.
- ☐ Remove us from your vendor list for this service.
- ☐ Other (explain below).

Comments: _____

Firm Name

Authorized Signature

Firm Address

Printed Name

City, State, Zip

Title

Date

Telephone / Fax

E-Mail Address



SECTION 01 22 00

UNIT PRICES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. List of unit prices, for use in preparing Bids.
- B. Measurement and payment criteria applicable to Work performed under a unit price payment method.
- C. Defect assessment and non-payment for rejected work.

1.02 COSTS INCLUDED

- A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services, taxes, and incidentals; erection, application, or installation of an item of the Work; overhead and profit.

1.03 UNIT QUANTITIES SPECIFIED

- A. Quantities indicated in the Bid Form are for informational purposes. **Contractor is to verify all quantities and bid the work to complete ALL WORK SHOWN OR DESCRIBED ON THE DRAWINGS.** Charges for over excavation of pavement sections due to poor subgrade support will be paid on a unit cost basis.

1.04 MEASUREMENT OF QUANTITIES

- A. Take all measurements and compute quantities. Measurements and quantities will be verified by the LPS third-party testing lab.
- B. Assist by providing necessary equipment, workers, and survey personnel as required.
- C. Measurement by Volume: Measured by cubic dimension, in-place, using mean length, width and height or thickness.
- D. Measurement by Area: Measured by square dimension using mean length and width or radius.



- E. Linear Measurement: Measured by linear dimension, along the item centerline or mean chord.
- F. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Engineer and LPS third-party testing lab prior to starting work.

1.05 PAYMENT

- A. Payment for Work governed by unit prices will be made on the basis of the actual in-place measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Engineer and LPS third-party testing lab, multiplied by the unit price.
- B. Payment will not be made for any of the following:
 - 1. Products wasted or disposed of in a manner that is not acceptable.
 - 2. Products determined as unacceptable before or after placement.
 - 3. Products not completely unloaded from the transporting vehicle.
 - 4. Products not properly stored and protected.
 - 5. Products placed beyond the lines and levels of the required Work.
 - 6. Products remaining on hand after completion of the Work.
 - 7. Loading, hauling, and disposing of rejected Products.

1.06 DEFECT ASSESSMENT

- A. Replace Work, or portions of the Work, not conforming to specified requirements. Manufacturer recommendations, and/or Industry Standards.
- B. If, in the opinion of Owner, it is not practical to remove and replace the Work, Owner will direct one of the following remedies:
 - 1. The defective Work may remain, but the unit price will be adjusted to a new unit price at the discretion of Owner.
 - 2. The defective Work will be partially repaired to the instructions of the Owner, and the unit price will be adjusted to a new unit price at the discretion of Owner.



- C. The authority of Owner to assess the defect and identify payment adjustment is final.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION



SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Preconstruction meeting.
- B. Site mobilization meeting.
- C. Progress meetings.
- D. Construction progress schedule.
- E. Submittals for review, information, and project closeout.
- F. Number of copies of submittals.
- G. Submittal procedures.

1.02 PROJECT MANAGEMENT

- A. Project Manager: Harry Lau, Livonia Public Schools
Project Engineer: David Lutz, NTH Consultants, Ltd.
NTH Project Manager: Cliff Andrews, NTH Consultants, Ltd.
- B. Cooperate with the Project Manager in allocation of mobilization/staging areas of site; for field offices and sheds, construction equipment, material storage and stockpiling, for vehicular and pedestrian access, traffic, and parking facilities.
- C. During construction, coordinate use of site and facilities through the Project Manager.
- D. Comply with Project Manager's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations, and resolution of ambiguities and conflicts.
- E. Comply with instructions of the Project Manager for use of temporary utilities and construction facilities.
- F. Coordinate field engineering and layout work under instructions of the Project Manager.



- G. Make the following types of submittals to Engineer through the Project Manager:
1. Requests for Information (RFI): RFIs are to be submitted with a coversheet indicating the RFI number, date, project location / school, written description of the RFI, and the requestor.
 2. Requests for substitution.
 3. Submittals: Shop drawings, product data, and samples. Submittals must include a coversheet indicating the date, the submittal number, the specification section and title, the school impacted by the submittal, the product, and the submittal type. Specific product types, colors, and other attributes are to be clearly marked on the product data by the Contractor.
 4. Test and inspection reports.
 5. Manufacturer's instructions.
 6. Field reports.
 7. Applications for payment and change order requests. Change Order Requests must indicate the date of the change order request, the school affect, the work change, associated unit costs, and total costs of the change order request.
 8. Progress schedules.
 9. Progress Photographs.
 10. Coordination drawings.
 11. Closeout submittals.

PART 2 - PRODUCTS

NOT USED



PART 3 - EXECUTION

3.01 PRECONSTRUCTION MEETING

- A. Livonia Public Schools will schedule a Preconstruction Meeting after Notice of Award.
- B. Attendance Required:
 - 1. Livonia Public Schools.
 - 2. Engineer.
 - 3. Contractor.
- C. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
 - 5. Designation of personnel representing the parties to Contract and Engineer.
 - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal requests, Change Orders, and Contract closeout procedures.
 - 7. Scheduling.
- D. Contractor will record minutes and distribute copies within two days after meeting to participants, with two copies to Engineer, Owner, participants, and those affected by decisions made.

3.02 SITE MOBILIZATION MEETING

- A. Owner will schedule a Site Mobilization Meeting at the Project site prior to Contractor occupancy.
- B. Attendance Required:



1. Contractor.
2. Owner.
3. Engineer.
4. Contractor's Superintendent.
5. Major Subcontractors.

C. Agenda:

1. Use of premises by Owner and Contractor.
2. Owner's requirements and occupancy prior to completion.
3. Construction facilities and controls provided by Owner.
4. Temporary utilities provided by Owner.
5. Survey and construction layout.
6. Security and housekeeping procedures.
7. Schedules.
8. Application for payment procedures.
9. Procedures for testing.
10. Procedures for maintaining record documents.
11. Requirements for start-up of equipment.
12. Inspection and acceptance of materials and equipment put into service during construction period.

- D. Contractor will record minutes and distribute copies within two days after meeting to participants, with two copies to Engineer, Owner, participants, and those affected by decisions made.

3.03 PROGRESS MEETINGS

- A. Schedule and administer Progress Meetings throughout progress of the Work at bi-weekly intervals.



- B. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Engineer, as appropriate to agenda topics for each meeting.
- C. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of Work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Review Request for Information responses and new RFIs as necessary.
 - 5. Identification of problems which impede planned progress.
 - 6. Review of submittals, schedule and status of submittals.
 - 7. Maintenance of progress schedule.
 - 8. Corrective measures to regain projected schedules.
 - 9. Planned progress during succeeding work period.
 - 10. Maintenance of quality and work standards.
 - 11. Effect of proposed changes on progress schedule and coordination.
 - 12. Other business relating to Work.
- D. Contractor will record minutes and distribute copies within two days after meeting to participants, with two copies to Engineer, Owner, participants, and those affected by decisions made.

3.04 CONSTRUCTION PROGRESS SCHEDULE

- A. Within 10 days after date of the Agreement, submit Preliminary Schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
- B. If Preliminary Schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of Preliminary Schedule, submit draft of proposed complete Schedule for review.



1. Include written certification that major contractors have reviewed and accepted proposed Schedule.
- D. Within 10 days after joint review, submit complete Schedule.
- E. Submit updated Schedule with each Application for Payment.

3.05 PROGRESS PHOTOGRAPHS

- A. Take and maintain one set of all Progress Photographs at project site for reference; same copies as submitted, identified as such.
- B. Photography Type: Digital; electronic files.
- C. Provide Progress Photographs of site and construction throughout progress of Work, produced by an experienced photographer, acceptable to Engineer.
- D. In addition to periodic, recurring views, take photographs of each of the following events:
 1. Pavement demolition.
 2. Proof rolling.
 3. Excavations in progress.
 4. Base course placement
 5. Pavement placement and compaction.
- E. Digital Photographs: 24-bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
 1. Delivery Medium: Via email.
 2. File Naming: Include project identification, date and time of view, and view identification.
 3. Point of View Sketch: Include digital copy of point of view sketch with each electronic submittal; include point of view identification in each photo file name.
 4. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.



5. Hard Copy: Printed hardcopy (color) of PDF file and point of view sketch.

- F. All progress photographs shall be submitted at the end of the project with close-out documents.

3.06 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 1. Product data.
 2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.
- B. Submit to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed only for aesthetic, color, or finish selection.

3.07 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 1. Design data (reference specification section or detail).
 2. Certificates.
 3. Test reports.
 4. Inspection reports.
 5. Manufacturer's instructions.
 6. Manufacturer's field reports.
 7. Other types indicated.
- B. Submit for Engineer's knowledge as contract administrator or for Owner. No action will be taken.



3.08 SUBMITTALS FOR PROJECT CLOSEOUT

- A. When the following are specified in individual sections, submit them at project closeout:
 - 1. Project record documents, including as-built drawings.
 - 2. Operation and maintenance data.
 - 3. Warranties.
 - 4. Bonds, at preconstruction meeting.
 - 5. Other types as indicated.
- B. Submit for Owner's benefit during and after project completion.
- C. See Section 01 7000, Article 3.10.I.

3.09 NUMBER OF COPIES OF SUBMITTALS

- A. Documents for Review:
 - 1. Small Size Sheets, not larger than 8-1/2 x 11 inches: Submit the number of copies which the Contractor requires, plus two copies which will be retained by the Engineer.
 - 2. Larger Sheets, not larger than 36 x 48 inches: Submit one reproducible transparency and one opaque reproduction.
- B. Documents for Information: Submit two copies.
- C. Documents for Project Closeout: Make one reproduction of submittal originally reviewed. Submit one extra of submittals for information.
- D. Samples: Submit the number specified in individual specification sections; one of which will be retained by Engineer.
 - 1. After review, produce duplicates.
 - 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.10 SUBMITTAL PROCEDURES

- A. Transmit each submittal with AIA Document G810 – Transmittal Letter.



- B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- C. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite the Project, and coordinate submission of related items.
- F. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
- G. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- H. Provide space for Contractor and Engineer review stamps.
- I. When revised for resubmission, identify all changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- K. Submittals not requested will not be recognized or processed.
- L. Create and maintain a log of all submittals and status.

END OF SECTION



SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. References and standards.
- B. Quality assurance submittals.
- C. Control of installation.
- D. Tolerances.
- E. Testing and inspection services.

1.02 REFERENCES

- A. Reference to standards, documents and codes included here in shall be to the last printed edition.
- B. ASTM C 1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
- C. ASTM D 3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
- D. ASTM E 329 - Standard Specification for Agencies Engaged Construction Inspection and/or Testing
- E. ACI Building Code Requirements for Structural Concrete-ACI 318



1.03 SUBMITTALS

- A. Testing Agency (Agency) Qualifications:
 - 1. Submit copy of report of laboratory facilities inspection made by AASHTO accredited Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
- B. Test Reports: After each test/inspection, promptly submit three copies of report, one each to Owner, Engineer, and Contractor.
 - 1. Include:
 - a. Date issued
 - b. Project title and number
 - c. Name of inspector
 - d. Date and time of sampling or inspection
 - e. Identification of product and specifications section
 - f. Location in the Project
 - g. Type of test/inspection
 - h. Date of test/inspection
 - i. Results of test/inspection
 - j. Conformance with Contract Documents
 - k. When requested by Engineer, provide interpretation of results
 - 2. Include reports prepared by representatives of suppliers and manufacturers who have performed field services. Include observations and recommendations in addition to the information listed in Article 1.03 B.1.



- C. Certificates: When specified in individual specification sections, submit certifications by the manufacturers and Contractor or installation/application subcontractor to Engineer, in quantities specified for Product Data.
 - 1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate. When multiple items are depicted on the data sheets, clearly identify with and arrow or circle the specific products intended for use on this project.
- D. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.04 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copies of standards at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, submit a Request for Information (RFI) from the Engineer before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Engineer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.05 TESTING AND INSPECTION AGENCIES

- A. Owner will employ and pay for services of an independent testing agency to perform other specified testing.



- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step, in the sequence provided.
- C. If Manufacturers' instructions conflict with Contract Documents, request clarification, in the form of an RFI, from Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have Work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. If the manufacturers' tolerances conflict with the Contract Documents, request clarification from the Engineer before proceeding.



- C. Adjust products to appropriate dimensions; position before securing products in place.

3.03 TESTING AND INSPECTION

A. Testing Agency Duties:

1. Provide qualified personnel at site. Cooperate with Engineer and Contractor in performance of services.
2. Perform specified sampling and testing of products in accordance with specified standards.
3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
4. Promptly notify Engineer and Contractor of observed irregularities or non-conformance of Work or products.
5. Perform additional tests and inspections required by Engineer.
6. Attend preconstruction meetings and progress meetings.
7. Submit reports of all tests/inspections specified.

B. Limits on Testing/Inspection Agency Authority:

1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the Work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the Work.

C. Contractor Responsibilities:

1. Deliver to Agency at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs.
2. Cooperate with Agency personnel and provide access to the Work and to manufacturers' facilities.



3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 4. Notify Engineer and Testing Agency 24 hours prior to expected time for operations requiring testing/inspection services.
 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- D. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Engineer.
- E. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.
- F. Scope: Comply with the Michigan Building Code and MDOT Standard Specifications for Construction for required testing and inspections. Additional testing and inspections may be required for this project, as specified in the appended Schedule of Testing and Inspection.
- G. Manufacturer's Field Services: When specified in the respective specification sections, suppliers/manufacturers are required to provide qualified personnel to observe and verify proper installation, quality of workmanship, and to make appropriate recommendations.

3.04 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not conforming to specified requirements.



- B. If, in the opinion of Engineer, it is not practical to remove and replace the Work, Engineer will direct an appropriate remedy or adjust payment.
- C. Expedite correction and replacement of Work found to be not-in-compliance to meet interim, substantial, and final completion dates.

END OF SECTION



SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Temporary utilities.
- B. Temporary sanitary facilities.
- C. Temporary Controls: Barriers, enclosures, and fencing.
- D. Security requirements.
- E. Waste removal facilities and services.
- F. Project identification sign.
- G. Field offices.

1.02 RELATED SECTIONS

- A. Section 01 5100 - Temporary Utilities.

1.03 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades required by governing authorities for public rights-of-way and for public access to existing building.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.



1.04 VEHICULAR ACCESS AND PARKING

- A. Coordinate access and haul routes with governing authorities and Owner.
- B. Provide and maintain access to fire hydrants, free of obstructions.
- C. Provide means of removing mud from vehicle wheels before entering streets.
- D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.
- E. Construction parking will be allowed in area of Construction Phase Boundary due to limited space on adjacent properties.
- F. Do not allow vehicle parking on new pavement.

1.05 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure and a minimum of 30 feet from all building walls. Store only enough flammable material on site for one days' use and remove any unused flammable material at the end of each workday.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.06 PROJECT IDENTIFICATION

- A. No signs are allowed without Owner's permission except those required by law.

1.07 REMOVAL OF TEMPORARY FACILITIES AND CONTROLS

- A. Clean and repair damage caused by installation or use of temporary work.
- B. Restore existing facilities used during construction to original condition.



PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION



SECTION 01 51 00

TEMPORARY UTILITIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Temporary Utilities: Electricity, lighting, heat, ventilation, and water.

1.02 RELATED SECTIONS

- A. Section 01 5000 - Temporary Facilities and Controls

1.03 TEMPORARY ELECTRICITY

- A. Cost: By Contractor.
- B. Provide power service as required.
- C. Provide main service disconnect and over-current protection at convenient location and meter.
- D. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.04 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain incandescent lighting for construction operations to achieve a minimum lighting level of 2 watt/sq ft for nighttime work.
- B. Provide and maintain 1 watt/sq ft lighting to exterior staging and storage areas after dark for security purposes.
- C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- D. Maintain lighting and provide routine repairs.
- E. Permanent building lighting may be utilized during construction.



1.05 TEMPORARY WATER SERVICE

- A. Cost of Water Used: By Contractor.
- B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.
- C. Connect to existing water source. Exercise measures to conserve water.
- D. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.

1.06 REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.
- B. Remove temporary underground installations to a minimum depth of 2 feet and grade site as indicated.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION



SECTION 01 57 13

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Prevention of erosion due to construction activities.
- B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
- C. Restoration of areas eroded due to insufficient preventive measures.
- D. Performance bond.
- E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.02 RELATED SECTIONS

- A. Section 31 1000 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.
- B. Section 31 2200 - Grading: Temporary and permanent grade changes for erosion control.
- C. Section 32 1123 - Aggregate Base Courses: Temporary and permanent roadways.

1.03 REFERENCES

- A. ASTM Standard D4355, "Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc Type Apparatus," ASTM International.
- B. ASTM Standard D4491, "Standard Test Methods for Water Permeability of Geotextiles by Permittivity," ASTM International.
- C. ASTM Standard D4533, "Standard Test Method for Trapezoid Tearing Strength of Geotextiles," ASTM International.



- D. ASTM Standard D4632, "Standard Test Method for Grab Breaking Load and Elongation of Geotextiles," ASTM International.
- E. ASTM Standard D4751, "Standard Test Method for Determining Apparent Opening Size of a Geotextile," ASTM International.
- F. ASTM Standard D4873, "Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples," ASTM International.
- G. ASTM Standard D6462, "Standard Practice for Silt Fence Installation," ASTM International.
- H. Environmental Protection Agency (EPA), National Pollutant Discharge Elimination System (NPDES), Construction General Permit; current edition; <http://cfpub.epa.gov/npdes/stormwater/cgp.cfm>.
- I. FHWA FLP-94-005, "Best Management Practices for Erosion and Sediment Control," Federal Highway Administration.

1.04 PERFORMANCE REQUIREMENTS

- A. Comply with all City of Livonia requirements.
- B. Comply with the requirements of the approved Demolition and Soil Erosion and Sedimentation Control Plan and submit periodic inspection reports to the Authority Having Jurisdiction.
- C. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits. **The cost of the permits will be the responsibility of the Contractor.**
- D. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.
- E. Timing: Put preventive measures in place prior to disturbance of surface cover.
- F. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.



1. 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.
 2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.
- G. Erosion On-Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
1. Control movement of sediment and soil from temporary stockpiles of soil.
 2. Repair ruts due to equipment and vehicular traffic on a daily basis.
 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- H. Erosion Off Site: 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.
1. Prevent windblown soil from leaving the project site.
 2. Prevent tracking of mud onto public roads outside site.
 3. Prevent mud and sediment from flowing onto sidewalks and pavements.
 4. If erosion occurs due to non-compliance with these requirements, restore eroded areas and arrange to have off site areas cleaned and returned to pre-construction condition at no cost to Owner.
- I. Sedimentation of Waterways On-Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
 2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.



- J. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
 - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction at no cost to Owner.
- K. Open Water: Prevent standing water that could become stagnant.
- L. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Erosion and Sedimentation Control Plan:
 - 1. Acknowledge intent to implement the approved Demolition and Soil Erosion and Sedimentation Control Plan and provide the planned date not less than 7 days prior to anticipated start of clearing, grading, or other work involving disturbance of ground surface cover.
 - 2. Include:
 - a. The approved Demolition and Soil Erosion and Sedimentation Control Plan.
 - b. Indicate any additional measures and associated costs that may be deemed necessary for Soil Erosion and Sedimentation Control. Additional measures must be approved by the Owner and Engineer, prior to implementation.
 - c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
 - d. Schedule of temporary preventive measures, in relation to ground disturbing activities.



- e. Other information required by law.
 - f. Format required by law is acceptable, provided any additional information specified is also included.
- 3. Do not begin work without the approval of the Demolition and Soil Erosion and Sedimentation Control Plan by the City of Livonia.
- C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.
- D. Identify a responsible person employed by the Contractor who will oversee the implementation of the Demolition and Soil Erosion and Sedimentation Control Plan.
- E. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.
- F. Maintenance Instructions: Provide instructions covering inspection and maintenance for temporary measures that must remain after Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Comply with the City of Livonia Standard Details and requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.



3.03 SCOPE OF PREVENTIVE MEASURES

- A. Do not discharge excavation ground water to the sanitary sewer, storm sewer, river, stream or similar natural or constructed feature.
- B. Prevent construction runoff from entering the sanitary sewer, storm sewer, river, stream or similar natural or constructed feature by using silt fences or other suitable methods.
- C. Protect surrounding soils from erosion.
- D. Install sedimentation control devices prior to beginning Work. Maintain effective functioning soil erosion and sedimentation control devices at all times during the course of the Work.
- E. If permanent erosion resistant measures have been installed, temporary preventive measures are not required.
- F. Dust Control
 - 1. Keep dust down at all times, including non-working periods.
 - 2. Sprinkle soil at the site, haul roads, and other areas disturbed by operations or treat with dust suppressants.
 - 3. Do not permit dry power-broom activities.
- G. Linear Sediment Barriers: Made of silt fences.
 - 1. Provide linear sediment barriers as shown on the Demolition and Soil Erosion and Sedimentation Control Plan.
- H. Storm Drain Inlet Sediment Traps: As detailed on drawings.

3.04 INSTALLATION

- A. General: Install soil erosion and sedimentation control devices as shown on the Drawings, in accordance with manufacturer's recommendations, and in conformance with these specifications. Refer discrepancies to Engineer for resolution.
- B. Silt Fences: Refer to the City of Livonia Standard Details and requirements.



3.05 MAINTENANCE

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Silt Fences:
 - 1. Promptly replace fabric that deteriorates unless need for fence has passed.
 - 2. Remove silt deposits that exceed one-third of the height of the fence.
 - 3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- D. Clean out temporary sediment control structures weekly and relocate soil on site.
- E. Place sediment in appropriate locations on site; do not remove from site.
- F. Refer to the City of Livonia Standard Details and requirements.

3.06 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Engineer.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION



SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Transportation, handling, storage and protection.
- C. Product option requirements.
- D. Substitution limitations and procedures.
- E. Spare parts and maintenance materials.

1.02 RELATED SECTIONS

- A. Section 01 4000 - Quality Requirements: Product quality monitoring.

1.03 SUBMITTALS

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
 - 1. Submit within 3 days after date of Agreement.
 - 2. For products specified only by reference standards, list applicable reference standards.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.



1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.
- E. Submittals must include a coversheet indicating the date, the submittal number, the specification section and title, the school impacted by the submittal, the product, and the submittal type. Specific product types, colors, and other attributes are to be clearly marked on the product data by the Contractor.

PART 2 - PRODUCTS

2.01 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.

2.02 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.03 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Provide spare parts, maintenance, and extra products of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 - EXECUTION

3.01 SUBSTITUTION PROCEDURES

- A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.



- C. A request for substitution constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 - 2. Will provide the same warranty for the substitution as for the specified product.
 - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 - 5. Will reimburse Owner and Engineer for review or redesign services associated with re-approval by authorities.
- D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- E. Substitution Submittal Procedure:
 - 1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution. Submit with the substitution request form at the end of this section.
 - 2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
 - 3. The Engineer will notify Contractor in writing of decision to accept or reject request. The decision of the Engineer will be final.

3.02 TRANSPORTATION AND HANDLING

- A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- B. Transport and handle products in accordance with manufacturer's instructions.
- C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.



- E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.
- F. Properly dispose of packing materials off site.

3.03 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products. Do not allow covering material to touch the ground.
- G. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

**NTH Consultants, Ltd.**

Infrastructure Engineering
& Environmental Services
41780 Six Mile Road
Northville, MI 48168

2025 Livonia Public Schools Pavement Project
Substitution Request Form

DATE	SECTION #	PARA #	SPECIFIED PRODUCT	PROPOSED SUBSTITUTION
_____	_____	_____	_____	_____

NOTE: Complete technical data and literature for the proposed substitution must be included with the submission of this form.

- | | | | |
|----|--|-----|-----|
| A. | Does substitution exceed, in any respect, the specified product/process? | __Y | __N |
| B. | Does substitution affect dimensions shown on Plans? | __Y | __N |
| C. | Does substitution affect other trades more than original product? | __Y | __N |
| D. | Does warranty differ from that specified? | __Y | __N |
| E. | Does substitution affect cost to OWNER? | __Y | __N |
| F. | Does substitution affect the project schedule? | __Y | __N |
| G. | Has substituted product/process been implemented on the site? | __Y | __N |

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

1. Explain any differences between proposed substitution and specified product.
2. Summarize experience with product and manufacturer in Project area.
3. If dimensions are affected by substitution, provide drawings and/or marked up project drawings indicating the dimensional changes.
4. If substitution affects structural design, submit stamped calculations.

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.

Name:	_____
Position:	_____
Company:	_____

Telephone:	_____
Signature:	_____
Date:	_____

For use by ENGINEER:

Engineer's Determination:

___ No Exceptions Taken Address:
___ Furnish as Corrected
___ Rejected
___ Returned Without Action

Response Required:

___ Revise and Resubmit
___ Resubmission Not Required



SECTION 01 70 00

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
- C. Cutting and patching.
- D. Surveying for laying out the work.
- E. Cleaning and protection.
- F. Closeout procedures, except payment procedures.

1.02 RELATED SECTIONS

- A. Section 01 3000 - Administrative Requirements: Submittals procedures.
- B. Section 01 4000 - Quality Requirements: Testing and inspection procedures.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of the As-Built site drawing signed by the Registered Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.



3. Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.
 4. Submit surveys and survey logs for the project record.
- C. Cutting and Patching: Submit written request in advance of cutting or alteration which affects:
1. Structural integrity of any element of Project.
 2. Integrity of weather exposed or moisture resistant element.
 3. Efficiency, maintenance, or safety of any operational element.
 4. Visual qualities of sight exposed elements.
 5. Work of Owner or separate Contractor.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.04 QUALIFICATIONS

- A. For survey work, employ a land surveyor registered in Michigan and acceptable to Engineer. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.05 PROJECT CONDITIONS

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from puddling or running water. Comply with the approved Demolition and Soil Erosion and Sedimentation Control Plan.
- C. Soil Erosion and Sediment Control: Comply with the Demolition and Soil Erosion and Sedimentation Control Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent soil erosion and sedimentation.
1. Minimize amount of bare soil exposed at one time.
 2. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.



- D. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations and equipment.

1.06 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements. **CALL MISS DIG (1-800-482-7171) THREE (3) DAYS BEFORE THE START OF PAVEMENT DEMOLITION AND/OR EXCAVATION AND RECEIVE CLEARANCE TO PROCEED. DO NOT PROCEED PRIOR TO RECEIVING CLEARANCE.**
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. Owner will have continuous occupancy of premises. Coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.



PART 2 - PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit the Substitution Request Form shown in Section 01 6000.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached. Proof roll the existing aggregate base after pavement demolition with a fully loaded tandem dump truck. Identify and repair areas with less than adequate support from the subgrade and/or aggregate base to the satisfaction of the Engineer. Provide unit prices to cover the repair work.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations, including but not limited to edge drains around the perimeter of the proposed pavement.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. To begin cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.



- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Engineer of any discrepancies discovered.
- C. Contractor shall locate and protect survey control and reference points.
- D. Control datum for survey is that indicated on Drawings.
- E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- F. Promptly report to Engineer the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to the Engineer.
- H. Utilize recognized engineering survey practices.
- I. Establish a minimum of two permanent benchmarks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
- J. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.



- K. Periodically verify layouts by same means.
- L. Maintain a complete and accurate log of control and survey work as it progresses.

3.04 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as shown.
 - 2. Report discrepancies to Engineer before disturbing existing installation.
 - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove items indicated on drawings.
 - 2. Relocate items indicated on drawings.



3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish, if necessary, for successful application of new finish.
 4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- C. Services (Including but not limited to Plumbing, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 3. Verify that abandoned services serve only abandoned facilities.
- D. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 3. Repair adjacent construction and finishes damaged during removal work.
 4. Patch as specified for patching new work.
- E. Adapt existing work to fit new work:
1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Engineer.



2. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Engineer review and request instructions.
- F. Clean existing systems and equipment.
 - G. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
 - H. Do not begin new construction in alterations phases before demolition is complete.
 - I. Comply with all other applicable requirements of this section.

3.06 CUTTING AND PATCHING

- A. Execute cutting and patching including excavation and fill to complete the work, demolition of pavement and selected areas of curb, to uncover work in order to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to execute patching to complement adjacent work, and to fit products together to integrate with other work.
- B. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- C. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- D. Restore work with new products in accordance with requirements of Contract Documents.
- E. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new work abuts or aligns with existing, perform a smooth and even transition.

3.07 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.



- B. Protect existing and proposed storm sewer, catch basins and edge drains from accumulating debris. At the time of closeout provide a letter from an independent source stating that all storm lines, catch basins and under drains are free of debris.
- C. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose of in a proper and legal manner off-site; do not burn or bury on site.

3.08 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Prohibit traffic from landscaped areas.

3.09 FINAL CLEANING

- A. Use cleaning materials that are nonhazardous.
- B. Clean site; sweep paved areas, rake clean landscaped surfaces.
- C. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in a proper and legal manner; do not burn or bury on site.

3.10 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities. Provide copies to Engineer and Owner.
- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in Contractor's Notice of Substantial Completion.
- C. Notify Engineer when work is considered ready for Substantial Completion Observation.



- D. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Engineer's review.
- E. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.
- F. Notify Engineer when work is considered finally complete.
- G. Complete items of work determined by Engineer's final inspection.
- H. Warranty time will not start until work has been finally completed and accepted by the Owner.
- I. Submit the following Closeout Documents to the Engineer:
 - 1. As-Built drawings, indicating all work completed; final construction limits, quantities, and amounts; installation variations from the contract documents; etc.
 - 2. Warranties and Guarantees
 - 3. Permitting, Bond, Plan Review, and Inspection documentation, including payment and close-out documentation
 - 4. Operation and maintenance manuals
 - 5. Full Conditional Waiver
 - 6. Full Unconditional Waiver of Lien and Sworn Statement
 - 7. Consent of Surety to Final Payment

END OF SECTION



SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
- E. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
- F. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, State and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.



- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.



- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
 - 1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
 - 2. Submit Report on a form acceptable to Owner.
 - 3. Landfill Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
 - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - 4. Incinerator Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
 - c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.



5. Recycled and Salvaged Materials: Include the following information for each:
 - a. Identification of material, including those retrieved by installer for use on other projects.
 - b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
 - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - e. Certification by receiving party that, materials will not be disposed of in landfills or by incineration.
6. Material Reused on Project: Include the following information for each:
 - a. Identification of material and how it was used in the project.
 - b. Amount, in tons or cubic yards.
 - c. Include weight tickets as evidence of quantity.
7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

- A. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.



- B. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.
- C. See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Engineer.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
 - 1. Pre-bid meeting.
 - 2. Pre-construction meeting.
 - 3. Regular job-site meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. Provide containers as required.
 - 2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 - 3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.



- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION



SECTION 03 20 00

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Reinforcing steel for cast-in-place concrete.
- B. Supports and accessories for steel reinforcement.

1.02 RELATED SECTION

- A. Section 32 1313 - Portland Cement Concrete Pavement

1.03 REFERENCES

- A. ACI Specification 301, "Specifications for Structural Concrete," American Concrete Institute.
- B. ACI Specification 318, "Building Code Requirements for Structural Concrete and Commentary," American Concrete Institute.
- C. ACI SP-66, "ACI Detailing Manual," American Concrete Institute.
- D. ASTM Standard A185, "Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete," ASTM International.
- E. ASTM Standard A615, "Standard Specification for Deformed and Plain Carbon-Steel Bars for Reinforcement," ASTM International.
- F. ASTM Standard A706, "Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement," ASTM International.
- G. ASTM Standard A996, "Standard Specification for Rail-Steel and Axle-Steel Deformed bars for Concrete Reinforcement," ASTM International.
- H. ASTM Standard A1064, "Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete," ASTM International.



- I. CRSI DA4, "Manual of Standard Practice," Concrete Reinforcing Steel Institute.
- J. CRSI P1, "Placing Reinforcing Bars," Concrete Reinforcing Steel Institute.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
 - 1. Prepare shop drawings under seal of a Professional Structural Engineer experienced in design of work of this type and licensed in Michigan.
- C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.
- D. Reports: Submit certified copies of mill test report of reinforcement materials analysis.
- E. Welders' Certificates: Submit certifications for welders employed on the project, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301.
- B. Employ a quality control program to assure that the reinforcing bars comply with the requirements of this Section.
- C. Owner may engage an independent testing laboratory to perform pullout tests on dowels to verify the bond strength and proper application of the adhesive. Locations for testing will be selected by the Engineer. Provide adhesively-embedded dowels for testing.
 - 1. Prequalification testing will be performed prior to the start of work or at the time of initial dowel installation.
 - 2. Acceptable loading of tested dowels without pullout/failure is 90 percent of their yield strength (10,800 and 16,700 pounds for No. 4 and No. 5 bars, respectively).
 - 3. Do not proceed with dowel installation until satisfactory pullout test results have been achieved and approved by the Engineer, unless Engineer determines that testing will not be required.



1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver reinforcement to the project site bundled, tagged and marked. Use metal tags that indicate bar size, length, and other information corresponding to markings shown on placement diagrams.
- B. At the site, store concrete reinforcement in an orderly manner on a platform or other above-ground support to facilitate inspection and to prevent damage and accumulation of dirt or excessive rust.

PART 2 - PRODUCTS

2.01 REINFORCEMENT

- A. Reinforcing Steel: ASTM A 615/A 615M Grade 60 (420).
- B. Reinforcing Steel: ASTM A 706/A 706M, deformed low-alloy steel bars.
- C. Reinforcing Steel: Deformed bars, ASTM A 996/A 996M Grade 40 (280), Type A.
- D. Steel Welded Wire Reinforcement: ASTM A1064
 - 1. Flat Sheets.
 - 2. Mesh Size and Wire Gage: As indicated on drawings.
- E. Reinforcement Accessories:
 - 1. Tie Wire.
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Examine the conditions under which concrete reinforcement is to be placed and immediately notify the Engineer in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.



3.02 PLACEMENT

- A. Comply with ACI 301/318, Chapter 5 and the Concrete Reinforcing Steel Institute's (CRSI) recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.
- B. Clean existing reinforcement of loose rust and mill scale, oil, earth, ice, and other materials that reduce bond with concrete.
- C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by chairs, runners, bolsters, spacers, and hangers, as required. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- D. Place supports for reinforcing bars at 4'-0" maximum spacing and a maximum of 6 inches from ends of the reinforcement.
- E. Comply with ACI 318 for minimum spacing between bars, concrete cover to form surfaces, and maximum bar relocation to avoid interference with other embedments.
- F. Provide standard reinforcement splices by lapping ends, placing bars in contact, and tying tightly with wire. Comply with requirements of ACI 318 for minimum lap of spliced bars and welded wire reinforcement.

3.03 FIELD QUALITY CONTROL

- A. Contractor shall notify Engineer and Inspection Agency 48 hours in advance of any reinforced concrete placement. Engineer or Inspection Agency will confirm installed reinforcement for conformance to contract documents before concrete placement.

END OF SECTION



SECTION 31 10 00

SITE CLEARING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Protection of vegetation.
- B. Removal of existing debris.
- C. Removal of concrete and bituminous pavement.

1.02 REFERENCES

- A. ASTM Standard C270, "Specification for Mortar for Unit Masonry," ASTM International.
- B. ASTM Standard C926, "Standard Specification for Application of Portland Cement-Based Plaster," ASTM International.
- C. Michigan Department of Transportation (MDOT), Standard Specifications for Construction.

1.03 SUBMITTALS

- A. See Section 01 30 00 for submittal procedures.
- B. Site Plan: Site Plan shall show Areas for temporary construction and field offices.
- C. Written permission to use disposal sites.
- D. Written evidence that proper arrangements have been made with the owner of the utility line, structure or pole that must be disturbed to accomplish the contracted Work.
- E. Copy of the Soil Erosion and Sedimentation Control permit.

1.04 QUALITY ASSURANCE

- A. Prior to commencing earthwork, obtain a Soil Erosion and Sedimentation Control permit from the appropriate agency having jurisdiction.
- B. Prior to commencing earthwork, CALL MISS DIG three days in advance of work and receive clearance.



- C. Secure all permits and post all bonds and deposits required to comply with the Soil Erosion and Sedimentation Control Act, Part 91 of PA 451 of 1994, as amended, and those of the enforcing agency.

1.05 PROJECT CONDITIONS

- A. Minimize production of dust due to clearing operations; do not use water if it will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- B. Comply with other requirements specified in Section 01 70 00.
- C. Protect trees, shrubs, and other vegetation that are outside the limits of the work and those that are within the limits of the work but not designated to be removed. Repair or replace trees, shrubs, and vegetation that are designated to be protected but are damaged by Contractor operations.
- D. Protect existing culverts, sewers, drainage structures, manholes, water gate wells, hydrants, water mains, utility poles, overhead lines, underground conduits, underground cables, pavement, and other improvements that are outside the limits of the work and those that are within the limits of the work but are not designated to be removed. Repair or replace, to the satisfaction of the Owner, structures and improvements that are designated to be protected but are damaged by Contractor operations. Replace damaged water mains and seepage bed tile in accordance with the requirements of the local County Department of Health.
- E. Maintain existing open drains, field and roadway ditches, drainage tile, sewers, enclosed drains, natural and artificial watercourses, surface drainage, and other types of drainage within the limits of the work free to discharge during excavating, backfilling and compacting operations. Immediately repair, replace, or clear drainage facilities that are not designated to be abandoned but are damaged or whose drainage function is impaired by Contractor operations.
- F. Maintain existing nearby roadways, sidewalks, and any other adjacent occupied site facilities during site clearing.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Fill Material: As specified in Section 31 23 23.13 – Soil Backfilling.



PART 3 - EXECUTION

3.01 TOPSOIL AND SAND ON SITE

- A. When construction takes place within private easements, sand shall not be removed from the private parcel or lot. If there is insufficient working area, the sand may be removed, stockpiled, and replaced on the original parcel or lot.

3.02 EXISTING UTILITIES AND BUILT ELEMENTS

- A. Locations of existing utilities shown on the Drawings are approximate; coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits. Contact MISS DIG three days in advance of proposed work and the public agency or utility having jurisdiction to request verification of utilities within the construction area.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction. Unless otherwise indicated, maintain flow in existing utilities by diversion, pumping, fluming, relocation, or by other methods. At the conclusion of construction, return and reinstall diverted and relocated utilities to their original condition.
- D. Protect existing structures and other elements that are not to be removed.
- E. Remove existing signs, posts, fences, and utility structures as designated by construction documents, as noted. Store these items on the site, where designated by Owner, in reusable condition.
- F. Expose utility lines prior to excavation to determine if conflicts with the proposed improvements exist. Be responsible for the cost of relocating items as required to resolve conflicts. Contact the owner of the utility for relocation.
- G. Protect existing buildings and structures within the limits of the project. If it becomes necessary to move an existing structure in order to proceed with construction, discuss the proposed movement with the Engineer and Owner prior to construction.

3.03 LANDSCAPING

- A. Do not begin clearing until vegetation to be relocated has been removed.
- B. Do not remove or damage vegetation beyond the following limits:
 - 1. 10 feet each side of surface walkways, patios, surface parking, and utility lines less than 12 inches in diameter.
 - 2. Vegetation cover within 15 feet of utility trenches.



- C. Install substantial, highly visible fences per construction documents to prevent inadvertent damage to vegetation to remain:
 - 1. At vegetation removal limits.
 - 2. Around other vegetation to remain within vegetation removal limits.
 - 3. See Section 01 50 00 for fence construction requirements.
- D. If, in the opinion of the Engineer, the Contractor's methods of protecting trees are not adequate, protect the trees by tunneling.
 - 1. Place tunnels at a minimum depth of 30 inches, measured from the ground surface to the top of the tunnel.
 - 2. Tunnel Length:
 - a. For tree trunks eight inches in diameter or larger, construct one foot of tunnel for each inch of tree diameter whenever the trench or any portion thereof approaches the tree trunk within a distance (measured in feet) of one-half the tree diameter (measured in inches).
 - b. Measure tree trunk diameter at four feet above the ground surface.
 - c. Tunnel requirements for tree trunks less than eight inches in diameter are the same as for tree trunks that are eight inches in diameter.
 - d. Example: Provide a 12-foot long tunnel for a tree that has a twelve-inch diameter trunk whenever the trench or any portion thereof approaches within six feet of the tree.
- E. In areas where vegetation must be removed, but no construction will occur, remove vegetation with minimum disturbance of the subsoil.
- F. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner. Prune tree limbs, branches, and roots that exhibit minor damage caused by Contractor operations to the satisfaction of the Engineer.

3.04 PAVEMENT

- A. Where concrete and bituminous pavement is required by the Drawings to be removed, include removing and disposing of pavement only, including base courses and surface courses. Existing curb and gutter will remain except for those areas that are designated and approved for removal and replacement. Remove pavement to saw cut.



1. Perform saw cutting with a power-driven pavement saw approved by Engineer.
 2. Provide minimum depth of saw cut of two inches.
- B. Old pavement with a concrete or bituminous cap is considered as one pavement, whether or not there is a separation layer of earth, aggregate, or bituminous material between the old material and the cap.
- C. Where integral curbs are to be removed flush with the existing pavement, perform removal by saw cutting or by cold milling, as approved by Engineer. Leave a neat and flush surface, without damage to the underlying pavement.
- D. Remove integral curb and gutter by saw cutting. Do not remove less than 18 inches wide for sections with rolled or straight curb nor less than 24 inches wide at mountable curbs.
- E. Remove and replace pavement that is damaged in areas beyond the designated removal limits.

3.05 FENCES

- A. Remove fences only where indicated on the Drawings. Fill in voids and holes resulting from fence removal in compliance with Section 31 23 23.13.
- B. Replace or restore existing fences whose removal was not called for on the Drawings; restore or replace to a condition comparable to that prior to construction.
- C. After fence removal or relocation operations are complete, remove and properly dispose of surplus material, unless otherwise indicated.

3.06 ADJUST STRUCTURES

- A. Adjust structures in which the elevation of the casting must be either raised twelve inches or less; or lowered six inches or less.
- B. Carefully remove and store the existing frame and cover. Reinstall frame and cover on the same structure unless a new frame and cover are required by the Drawings.
- C. Remove or install clay brick or concrete block adjustment rings as necessary to adjust the structure's frame and cover to the proper elevation. Set clay brick and concrete block adjustment rings in ASTM C270 Type S or Type M mortar, unless otherwise shown on the Drawings or determined by the Engineer.
- D. Provide a Portland cement plaster coat on the outside surface of the new clay brick or concrete block structures, a minimum of 1/2 inch (10 mm) thick, in accordance with ASTM C926. Clean the structure prior to backfilling.



- E. Backfill the structure in compliance with Section 31 23 23.13.
- F. Maintain flow in the entire system while performing the Work.
- G. Properly dispose of unsuitable material.

3.07 RECONSTRUCT STRUCTURES

- A. Reconstruct structures in which the elevation of the casting must be raised more than twelve inches, lowered more than six inches, and where portions of the existing structure are deteriorated.
- B. Carefully remove and store the existing frame and cover. Reinstall the frame and cover on the same structure unless a new frame and cover are required by the Drawings.
- C. Remove the existing corbel entrance sections and precast concrete chimney type entrance, along with additional brick courses or precast concrete sections as necessary to achieve the amount of reconstruction required by the Drawings or as determined by the Engineer.
- D. Install brickwork and precast concrete sections to meet the design grade. Set clay brick and concrete in ASTM C270 Type S or Type M mortar, unless otherwise shown on the Drawings or determined by the Engineer.
- E. Furnish and install manhole steps so that the maximum spacing is 24-inches.
- F. Provide a Portland cement plaster coat on the outside surface of the new clay brick or concrete block structures, a minimum of 1/2 inch (10 mm) thick, in accordance with ASTM C926. Clean the structure prior to backfilling.
- G. Backfill the structure in compliance with Section 31 23 23.13.
- H. Maintain flow in the entire system while performing the Work.
- I. Properly dispose of unsuitable material.

3.08 RESTORATION IN RIGHT-OF-WAY

- A. Restore right-of-way, not paved or aggregate-surfaced, as follows, unless indicated otherwise on the Drawings.
 - 1. The disturbed areas may be shaped by "Machine Grading" or another method approved by the Engineer to achieve the cross section, line and grade shown on the Drawings.



2. Restore areas with slopes of 1-on-4 or flatter with topsoil and seed.
 3. Restore areas with slopes steeper than 1-on-4 with topsoil and sod.
- B. Properly dispose of excess material from the restoration operation.
- C. Furnish, place, and compact additional fill, in compliance with Section 31 23 23, as needed to restore the disturbed areas to the cross sections called for on the Drawings or as determined by the Engineer.

3.09 RESTORATION OF PAVED SURFACES

- A. Restoration includes furnishing backfill, compacting, forming, placing, rolling, floating, jointing, finishing, curing, and providing protection against elements.
- B. Restore roadways that are partially damaged to include a minimum replacement of one (1) full width lane of roadway. The length of replacement shall be at least equal to the width.
- C. Concrete Restoration
1. Backfill trenches crossing concrete driveways, sidewalks, roads, streets, or parking areas to the bottom of the proposed pavement, as specified in Section 31 22 00.
 2. Unless otherwise specified on the Drawings or determined by the Engineer, replace removed concrete with 4,000 psi compressive strength concrete of the thickness removed. Include reinforcing equal to existing. Comply with Section 32 13 13.
 3. Include construction of sidewalk ramps at the intersection of the curb with restoration of sidewalks. Provide sidewalk ramps that conform to the current rules and regulations of Act 8, Michigan PA 1973, as amended.
- D. Bituminous Restoration
1. Backfill trenches crossing parking areas to the bottom of the base course, as specified in Section 31 23 23.13
 2. Replace bituminous pavement to match in kind.
 3. Resurface bituminous-surfaced areas beyond the limits of the work when those surfaces are disturbed by the subject work including, but not limited to, the passage of equipment. Resurface with an approved bituminous mixture as shown on the Drawings, but in no case less than two (2) inches in thickness. Extend the replacement material to smooth-cut edges, uniform in direction and at an elevation that provides a uniform surface between the undisturbed abutting surfaces.



3.10 DEBRIS AND CLEAN-UP

- A. Remove debris, junk, and trash from site.
- B. Fill holes due to removal of earth in accordance with Section 31 22 00 and Section 31 23 23.
- C. Leave site in clean condition, ready for subsequent work.
- D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION



SECTION 31 22 00

GRADING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Removal and salvage of topsoil.
- B. Rough grading the site for site structures, utilities, and pavements.
- C. Finish grading.

1.02 QUALITY ASSURANCE

- A. Perform Work in accordance with these specifications. Maintain one copy of the specifications on site.

1.03 PROJECT CONDITIONS

- A. Protect above- and below-grade utilities that remain.
- B. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.
- C. Protect benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs, designated to remain, from grading equipment and vehicular traffic.
- D. Provide temporary erosion and sediment control in compliance with Section 01 5713.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that survey benchmark and intended elevations for the Work are as indicated.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.



- C. Locate, identify, and protect utilities that remain, from damage.
- D. Call MISS DIG three days in advance of work and notify utility company to remove and/or relocate utilities.
- E. Remove and dispose of vegetation, brush, stones, rocks and other objectionable litter and foreign material before the ground is broken for topsoil removal.

3.03 ROUGH GRADING

- A. Remove existing pavements from areas to be further excavated or re-graded, without mixing with foreign materials.
 - 1. Do not strip pavements if weather conditions are unsuitable.
 - 2. If approved by Engineer, salvage topsoil for reuse.
 - 3. Dispose of salvaged topsoil in excess of that required for the project.
- B. Remove and dispose of material detrimental to site improvement in accordance with Section 31 10 00.
- C. Do not remove topsoil when wet.
- D. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded. Remove subsoil parallel to proposed finished grades and to elevations that allow for thickness of pavement section. Do not over-excavate.
- E. Do not remove wet subsoil unless it is subsequently processed to obtain optimum moisture content.
- F. When excavating through roots, perform work by hand and cut roots with sharp axe.
- G. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.04 SOIL REMOVAL

- A. Stockpile topsoil to be re-used on site; remove remainder from site. Locate stockpiles as near the original location as possible.
- B. Stockpile subsoil to be re-used on site in an approved area and remove remainder from site. Segregate contaminated fill suitable for reuse as backfill from native uncontaminated soil and from imported engineered fill.
- C. Stockpiles: Use areas designated on site; pile depth not to exceed 10 feet; protect from erosion; avoid diversion of storm water runoff, creating standing water, and interference of controlled irrigation.



1. Do not stockpile around trunks and roots of trees to be preserved.
2. Maintain stockpiled topsoil separate from stockpiled subsoil.
3. Locate and retain soil materials at least 100 feet away from edge of excavations.

3.05 FINISH GRADING

- A. Before Finish Grading:
 1. Verify Ff backfilling has been inspected.
 2. Verify subgrade has been contoured to grades and elevations shown on the Drawings and has been compacted.
- B. Remove debris, roots, branches, stones, more than 1/2 inch in size. Remove soil contaminated with petroleum products in lawful manner.
- C. Perform finished grading when the ground is frost-free and weather is favorable.
- D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.
- E. Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregularities.
- F. Lightly compact placed topsoil.

3.06 TOLERANCES

- A. Top Surface of Subgrade: Plus, or minus (+/-) 1/10 foot from required elevation.
- B. Top Surface of Finish Grade: Plus, or minus (+/-) 1/2 inch.

3.07 CLEANING AND PROTECTION

- A. Remove unused stockpiled topsoil and subsoil. Grade the stockpile area to prevent standing water.
- B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION



SECTION 31 23 13

SUBGRADE PREPARATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Removal and salvage of topsoil.
- B. Proof-rolling subgrade.
- C. Undercutting and backfilling areas that are unstable.

1.02 QUALITY ASSURANCE

- A. Perform Work in accordance with these specifications. Maintain one copy of the specifications on site.

1.03 PROJECT CONDITIONS

- A. Protect above- and below-grade utilities that remain.
- B. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.
- C. Protect benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs, designated to remain, from grading equipment and vehicular traffic.
- D. Provide temporary erosion and sediment control in compliance with Section 01 57 13.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that survey benchmark and intended elevations for the Work are as indicated.



3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect utilities that remain from damage.
- D. Call Miss Dig three days in advance of work and notify utility company to remove and/or relocate utilities.
- E. Remove and dispose of vegetation, brush, stones, rocks and other objectionable litter and foreign material before the ground is broken for topsoil removal.

3.03 ROUGH GRADING

- A. Remove existing pavements from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.
 - 1. Do not strip pavements if weather conditions are unsuitable.
 - 2. If approved by Engineer, salvage topsoil for reuse.
 - 3. Dispose of salvaged topsoil in excess of that required for the project.
- B. Remove and dispose of material detrimental to site improvement in accordance with Section 31 1000.
- C. Do not remove topsoil when wet.
- D. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded. Remove subsoil parallel to proposed finished grades and to elevations that allow for thickness of pavement section. Do not over-excavate.
- E. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.
- F. When excavating through roots, perform work by hand and cut roots with sharp axe.
- G. Proof-roll subgrade to receive fill material with a fully loaded tandem dump truck to detect unstable areas.
- H. Stability: Replace damaged, displaced and/or unstable subsoil to same requirements as for specified fill.

3.04 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus (+/-) 1/10 foot from required elevation.



3.05 CLEANING AND PROTECTION

- A. Remove unused stockpiled topsoil and subsoil. Grade the stockpile area to prevent standing water.

END OF SECTION



SECTION 31 23 16

EXCAVATION

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Excavating for paving and slabs-on-grade.

1.02 SUBMITTALS

- A. Submit sheeting, shoring, and bracing plans for information only (if used).
- B. Excavation Plan: Prior to the start of excavation work, submit written plan that demonstrates compliance with the Contract Documents and OSHA Standard 29 CFR Part 1926.650. As a minimum, include:
 - 1. Name of competent person responsible for excavation operations.
 - 2. Excavation method(s) and protective system(s) to be used.
 - 3. Manufacturer's data if proprietary protective system(s) are designed based on such data.
- C. Stockpiling Plan: Prior to the start of excavation work, submit temporary soil stockpiling plan. Include provisions for maintaining stockpiles during the work and removal of stockpiles upon completion of the work.

1.03 QUALITY ASSURANCE

- A. Obtain necessary permits for work in roads, rights-of-way, railroads, etc. Also obtain permits as required by local, state, and federal agencies for discharging water from excavations.
- B. Perform Work in compliance with applicable requirements of governing authorities having jurisdiction, including local, county, state, and federal requirements, as applicable.
- C. Comply with OSHA Standard, Title 29, Code of Federal Regulations, Part 1926, Section 650 (Subpart P - Excavations).

1.04 PROJECT CONDITIONS

- A. Verify that survey benchmark and intended elevations for the Work are as indicated.
- B. Protect plants, lawns, rock outcroppings, and other features to remain.



- C. Protect benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- D. Perform excavations as indicated on the Drawings.
- E. Existing Structures
 - 1. Surface structures and underground structures shown on the Drawings are based on existing records and limited investigation. This information is provided for the convenience of the Contractor and is not guaranteed to be complete or correct.
 - 2. Explore ahead of the required excavation to determine exact locations of structures.
 - 3. Support and protect existing structures from damage. Immediately restore damaged and broken structures at no cost to Owner if damage or breakage was the result of Contractor operations.
- F. Existing Utilities
 - 1. Locate existing underground utilities in the areas of Work. If utilities are to remain in place, provide adequate means of protection.
 - 2. If uncharted or incorrectly charted piping or other utilities are encountered during excavation, consult piping or utility owner and Engineer immediately for direction. Cooperate with Owner and utility owner in keeping services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
 - 3. Do not interrupt utilities serving facilities occupied and used by Owner or others, except when permitted in writing by Engineer and then only after acceptable temporary utility services have been provided.
 - 4. Demolish and completely remove from site underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.
- G. Protection of Persons and Property
 - 1. Barricade open excavations occurring as part of the work and post with warning lights. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
 - 2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.



- H. Dust Control: Conduct operations and maintain areas of activity to minimize creation and dispersion of dust, including sweeping and sprinkling of roadways. Calcium chloride may be used to control serious or prolonged dust problems, only when explicitly approved in advance by Engineer.
- I. Temporary Fencing: Furnish and install a temporary fence surrounding excavations.
- J. Protect excavations by proper sloping, shoring, and bracing or any other method required to conform to all MIOSHA requirements and prevent soil movement.
- K. Provide the minimum required frost protection for any shallow foundations during excavations.
- L. Notify owner representative of unexpected surface conditions in accordance with project documents.

PART 2 - PRODUCTS

- A. Excavated materials that contain debris, organics, and other deleterious materials should not be used as backfill material in the structural areas, but can only be used for backfill in non-structural areas, such as landscape areas.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. See Section 31 22 00 for additional requirements.
- C. Clear landscaping including trees, brush, roots, stumps, logs, vegetation, sod, topsoil, organic matter, wood, and other materials and debris from areas to be occupied by permanent construction or embankments or excavations as needed.
 - 1. Promptly remove waste materials from the site.
 - 2. Properly dispose of waste materials. Burning and/or encapsulating debris are not permitted.
- D. Carry out program of pre-excavation, excavation, groundwater control, excavation support and bracing in such manner as to eliminate undermining or disturbing buried utilities, conduits, foundations of existing structures, or of work previously completed under this project contract.



- E. Do not plow, scrape, or dig by mechanical means (e.g., excavator, loaders, etc.), earth near the finished subgrade in a manner that will result in disturbance of material below subgrade. Remove with pick and shovel, material to be excavated, just before placing pipe, concrete, or other structure.
- F. Excavate to widths that give suitable room for buildings and structures or laying and jointing piping or other utilities; furnish and place all sheeting, bracing, and supports; do all coffer damming, pumping, and draining; and render bottom of excavations firm and dry and acceptable in all respects.

3.02 SHEETING, SHORING AND BRACING

- A. Furnish, place, and maintain sheeting, shoring, and bracing of the excavation to ensure safety of people in and around the excavation. Protect the new Work, existing construction, and pedestrian and vehicular traffic.
- B. Be responsible for the design of sheeting, shoring, and bracing. Design to provide strength, quality, dimension and spacing of sheeting, shoring, and bracing of existing soil conditions to prevent caving, loss of ground, and squeezing within the lines of the excavation and effectively restrain movement of the adjacent soil.
 - 1. Design in conformance with current federal, state, and local regulations for safety.
 - 2. Do not permit sheeting, shoring, and bracing to come into contact with pipes. Install sheeting, shoring, and bracing to prevent concentrated loads and horizontal thrusts from being transmitted to the pipe.
- C. Where indicated on the Drawings and where necessary in the Work, leave sheeting, shoring, and bracing in place.
- D. Provide supports for pipes, conduits, and similar construction that crosses the excavation. If required, leave such supports in place.
- E. Do not remove sheeting, shoring, and bracing until pipes in trenches have been properly bedded and the trench has been backfilled to sufficiently support the external loads.
- F. Do not remove earth material below the bottom of a shield beyond the limits established by ordinances, codes, laws, and regulations.
- G. When removing or moving a shield ahead, take care to prevent movement of pipe or structures and avoid disturbing the bedding for pipes and structures. Remove and reinstall pipes and structures that are disturbed.



3.03 EXCAVATING

- A. Excavate to accommodate construction operations. Excavation is unclassified, and includes contaminated and uncontaminated earth, sand, clay, gravel, hardpan, boulders not requiring drilling and blasting for removal, concrete debris, decomposed rock, pavements, rubbish, and other materials within the excavation limits.
- B. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- C. Verify soil bearing capacity and obtain Owner's Representative approval of soil conditions prior to placing any pavement or fill soils.
- D. Excavate all classes of materials and obstructions encountered for work specified under this Contract to the lines and grades shown on the drawings.
- E. Periodically inspect excavations. If any signs of instability are found, promptly notify the Owner's Representative, and immediately begin remedial action to stabilize the condition.
- F. Unless otherwise indicated, provide open excavations for structures and pipelines. Utilize protection systems as follows:
 - 1. Excavation Less Than Three Feet Deep: Excavations in soils where there is not potential for a cave-in may be made with vertical sides. For other soils, provide excavations that are sloped and benched, shielded, or shored and braced.
 - 2. Excavation More Than Three Feet Deep: Provide excavations that are sloped and benched, shielded, or shored and braced.
 - 3. Install and maintain protection system(s) in compliance with the approved Excavation Plan.
- G. Excavate so that future work can be laid to the alignment, grade, and dimensions indicates on the drawings.
- H. Do not interfere with 45 degree bearing splay of foundations.
- I. Cut utility trenches wide enough to allow inspection of installed utilities.
- J. Perform pavement cutting by saw or other methods satisfactory to the authorities having jurisdiction. Do not perform pavement breaking by drop weight or other impact type equipment.
- K. Hand trim excavations. Rounded and undercut edges will not be permitted for footing excavations. Remove loose matter.



- L. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume.
- M. Provide subgrade for roadways, structures and trench bottoms that is firm, dense, and thoroughly compacted and consolidated; free from mud, muck, and other soft or unsuitable materials; and firm and intact.
 - 1. Reinforce subgrade that is otherwise solid but becomes soft or mucky on top due to construction operations, with crushed stone or gravel.
 - 2. Do not permit the finished elevation of stabilized subgrade to be above subgrade elevations shown.
- N. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- O. Remove excavated material that is unsuitable for re-use from site.
- P. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 22 00.
- Q. Remove excess excavated material from site.
- R. Control groundwater infiltration in all excavations to avoid disturbing soils on the bottom and sides of excavation.
- S. Where excavations may expose existing foundations to potential frost heave, provide adequate protection to prevent freezing below foundations.
- T. Fill over-excavated areas in accordance with directions by Owner's Representative. If the over-excavation is a result of contractor error, work will be at no additional cost to the Owner.
- U. Dispose of materials removed from the site in compliance with ordinances, codes, laws, and regulations of authorities having jurisdiction.

3.04 EXCESS EXCAVATION

- A. Excess excavation is defined as surplus earth material, free of brush, roots, stumps, broken concrete, pipe, debris, and other extraneous material, that is realized from the construction.
- B. When requested by the Owner, transport excess excavation to a site(s) designated by the Owner. Grade the excess excavation to provide positive surface drainage of the site so that adjacent properties are not damaged or affected. Include removal of surface irregularities to provide a smooth surface (± 0.25 foot).
- C. When transportation of excess excavation has not been requested by the Owner, remove and properly dispose of the material.



- D. Brush, roots, stumps, broken concrete, pipe, debris, and other extraneous material from the construction is the property of the Contractor. Properly dispose of this material in accordance with applicable laws, rules, and regulations.

3.05 DRAINAGE AND DEWATERING

- A. Prevent surface and subsurface water from flowing into excavations and from flooding adjacent areas.
- B. Remove water from excavation as fast as it collects.
- C. Maintain the ground water level below the bottom of the excavation to provide a stable surface for construction operations, a stable subgrade for permanent work, and to prevent damage to the Work.

3.06 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.
- B. Provide for visual inspection of storm basins and pipe during construction.

3.07 PROTECTION

- A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION



SECTION 31 23 23.13

SOIL BACKFILLING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Requirements for backfilling of excavation or trenches to the original surface of the ground or to such other grades as may be shown or required.

1.02 REFERENCE STANDARDS

- A. American Concrete Institute (ACI)
 - 1. ACI 347 Guide to Formwork for Concrete
- B. ASTM (ASTM International)
 - 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 D2974 Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
- C. MDOT (Michigan Department of Transportation)
 - 1. Standard Specification for Highway Construction, current edition.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Backfill with sound materials, free from waste, organic matter, rubbish, boggy, or other unsuitable materials.
- B. General Materials Requirements: Ensure that materials used for backfilling conform to the agency having jurisdiction specified requirements provided on the project Drawings. Follow suitable fill requirements whenever drainage or select fill is not specified. Determine and obtain the approval of the appropriate test method where more than one compaction test method is specified.
- C. Frozen Materials: Do not use frozen material for backfilling.



- D. Stockpiling: Do not stockpile material on top of existing underground structures.
- E. More specific requirements may be shown on project Drawings.
- F. Backfill all annular spaces near or under pavement and structures with select fill compacted to 95% of the maximum dry density as determined by the Modified Proctor Test (ASTM D1557).

2.02 SELECT FILL

- A. Materials for Select Fill: Use MDOT Class II Granular Material as approved for Fill and thoroughly compact to 95 percent of the maximum dry density obtainable by ASTM D1557.
 - 1. Very fine sand, uniformly graded sands and gravel, or other materials having a tendency to flow under pressure when wet are unacceptable.
 - 2. Existing on-site soils are not considered suitable for use as select fill, regardless of whether such soils meet the gradation requirements for select fill. Select fill is strictly an imported material brought to the site from off-site sources.
- B. Materials for Drainage Aggregate: Use material meeting the requirements for MDOT 17A or MDOT 6A coarse aggregate produced from natural materials. Material produced from crushed concrete or slag is not acceptable and may not be placed as drainage aggregate.
- C. Materials for Common Fill: Non-contaminated material from on-site excavation may be used as common (non-structural) fill provided that it can be readily compacted to 90 percent of the maximum dry density obtainable by ASTM D1557 and is sound material free of waste, organic matter, rubbish, or other unsuitable material. Select fill may be used as common fill at no change in the contract price.
 - 1. Granular Materials On-Site: Granular on-site material, which is fairly well graded between the following limits may be used as granular common fill:

U.S Standard Sieve Size	Percent Passing by Weight
3-inch	100
#10	50-100
#60	20-90
#200	0-20

- 2. Cohesive Materials On-Site: Cohesive site material that is obtained from excavation above the higher of the groundwater level may be used as common fill. Use of these materials should be limited for the cohesive materials with liquid limit less than or equal to 40 and plasticity index less than or equal to 20.



2.03 PIPE BEDDING FOR DIRECT BURIED PIPE

- A. Bed the placed pipe with a minimum of 4-inches of compacted approved sand or aggregate fill continued to 1-foot above the pipe. Sand or aggregate fill used for bedding should contain the following: 100% passing 3/8-inch sieve or as specified on the project drawings.
- B. Place bedding in accordance with agency having jurisdiction standards and project Drawings.

2.04 TOPSOIL

- A. Topsoil is defined as friable clay loam surface soil found in a depth of not less than 3 inches. Topsoil will be substantially free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, and other objectionable material. Minimum organic content of 3.5% when determined in accordance with ASTM D2974.
- B. Strip topsoil which is satisfactory to whatever depths are encountered, and in such manner as to prevent intermingling with the underlying subsoil or other objectionable material. Remove heavy growths of grass from areas before stripping.

2.05 AGGREGATE FILL

- A. See Section 32 11 23 for aggregate fill requirements.

PART 3 - EXECUTION

3.01 GENERAL

- A. For areas to be covered by topsoil, leave or stop backfill 3 inches below the finished grade or as indicated in Section 32 90 00. Remove from all backfill, any compressible, putrescible, or destructible rubbish and refuse and all lumber and excavation supports from the excavated space before backfilling is started.
- B. Equipment Limitations: Do not permit construction equipment used to backfill to travel against and over cast-in-place concrete structures until the specified concrete strength has been obtained, as verified by concrete test cylinders. In special cases where conditions warrant, the above restriction may be modified, provided the concrete has gained sufficient strength, as determined from test cylinders, to satisfy design requirements for the removal of forms and the application of load.

3.02 SOURCE QUALITY CONTROL

- A. A qualified laboratory will be selected and paid by the Owner to perform tests on fill materials. The Contractor will bear cost of testing materials which fail to conform to



Specifications on the first test. Test results and laboratory recommendations will be available to Contractor.

- B. Provide samples of each fill material from the proposed source of supply. Allow sufficient time for testing and evaluation of results before material is needed. Submit samples from alternate source if required.
- C. Engineer will be sole and final judge of suitability of all material.
- D. The laboratory will determine maximum dry density at optimum water content in accordance with ASTM D1557.
- E. Tests of material as delivered may be made from time to time. Materials in question may not be used pending test results. Remove rejected materials and replace with new approved material.

3.03 DUST CONTROL

- A. During progress of work, conduct operations and maintain area of activities, including sweeping and sprinkling of streets or parking lots as necessary, so as to minimize the creation and dispersion of dust; maintain dust control.

3.04 PIPE BEDDING AND INITIAL BACKFILL

- A. Pipe Fill: Suitably support pipes and prevent pipe float to prevent damage to piping. Place select fill by hand for initial pipe backfill from top of bedding to a minimum 1 foot over top of pipes in uniform layers not greater than 6 inches in loose thickness. Tamp and thoroughly compact in place the select fill with suitable mechanical or pneumatic tools to not less than 95 percent of the maximum dry density as determined by ASTM D 1557.
- B. Do not place large stone fragments in the pipe bedding or backfill to 1 foot over the top of pipes, nor nearer than 2 feet at any point from any pipe, conduit, or concrete wall.
- C. Do not use pipe bedding containing very fine sand, uniformly graded sands and gravels, or other materials that have a tendency to flow under pressure when wet.

3.05 STRUCTURE BACKFILL

- A. Use of Select Fill: Use select fill beneath all structures and adjacent to structures where pipes and connections are to be located within this fill, except where aggregate base course or drainage aggregate is specified or shown on project drawings. Use select fill beneath all pavements, walkways, and extend to the bottom of pavement base course or ballast. Use select fill or aggregate fill where indicated on drawings.
 - 1. Place backfill in uniform layers not greater than 9 inches in loose thickness and thoroughly compact in place with suitable approved mechanical or pneumatic equipment.



2. Compact backfill to not less than 95 percent of the maximum dry density as determined by ASTM D1557.
 3. Place base course beneath all concrete and asphalt repairs, to the depths, lines and grades shown on the drawings, and compacted to 95 percent of the maximum dry density as determined by ASTM D1557.
- B. Use of Clay: In unpaved areas adjacent to structures for the top 1 foot of fill directly under lawn subgrades use low cohesive clay (other than wet unstable clay) backfill placed in 6-inch lifts. Compact clay backfill to not less than 90 percent of the maximum dry density as determined by ASTM D1557.
1. Use clay having a liquid limit less than or equal to 40 and a plasticity index less than or equal to 20.
- C. Use of Common Fill: Use common granular fill adjacent to structures in all areas not specified above or as indicated on drawings, unless otherwise shown or specified. Select fill may be used in place of common granular fill at no additional cost.
1. Extend such backfill from the bottom of the excavation or top of bedding, to the bottom of subgrade for lawns or planting areas, or to such other grades as may be shown or required.
 2. Place backfill in uniform layers not greater than 12 inches in loose thickness and thoroughly compact in place with suitable equipment, as specified above.

3.06 COMPACTION EQUIPMENT

- A. Equipment and Methods: Carry out all compaction with suitable approved equipment and methods.
1. Compact clay and other cohesive material with sheep's-foot rollers or similar equipment where practicable. Use handheld pneumatic tampers elsewhere for compaction of cohesive fill material.
 2. Compact low cohesive soils with pneumatic-tire rollers or large vibratory equipment where practicable. Use small vibratory equipment elsewhere for compaction of cohesionless fill material.
 3. Do not use heavy compaction equipment over pipelines or other structures unless the depth of fill is sufficient to adequately distribute the load.

3.07 FINISH GRADING

- A. Topsoil: Spread the topsoil uniformly to provide a smooth, even surface at the finish grades indicated on the Drawings or acceptable to the Engineer. After spreading,



compact the topsoil lightly, as necessary, to minimize settlement. Final grades will be free of voids and soft spots.

- B. Final Contours: Perform finish grading in accordance with the completed contour elevations and grades shown and blend into conformation with remaining natural ground surfaces.
 - 1. Leave all finished grading surfaces smooth and firm to drain.
 - 2. Bring finish grades to elevations in accordance with Section 31 22 00.
- C. Surface Drainage: Perform grading outside of building or structure lines in a manner to prevent accumulation of water within the area. Where necessary or where shown, extend finish grading to ensure that water is carried to stormwater infrastructure, and the site area left smooth and free from depressions holding water.
- D. Perform finished grading when the ground is frost-free and weather is favorable.

3.08 RESPONSIBILITY FOR AFTER SETTLEMENT

- A. Correct depressions which may develop in backfilled areas from settlement within one year after the work is fully completed. Provide as needed, backfill material, pavement base replacement, permanent pavement, sidewalk, curb and driveway repair or replacement, and lawn replacement, and perform the necessary reconditioning and restoration work to bring such depressed areas to proper grade as approved.

3.9 INSPECTION AND TESTING OF BACKFILLING

- A. Sampling and Testing: The Owner will retain testing services for backfilling operations. Cooperate with testing agency and provide accommodations and access for testing agency to complete their work.
- B. Correction of Work: Correct any areas of unsatisfactory compaction by removal and replacement, or by scarifying, aerating, or sprinkling as needed and re-compaction in place prior to placement of a new lift.

END OF SECTION



SECTION 31 23 23.23

COMPACTING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes backfill compaction operations. The work includes, but is not limited to:
 - 1. Proof-rolling, stabilization, and compaction of subgrade.
 - 2. Placement and compaction of backfill.

1.02 REFERENCE STANDARDS

- A. ASTM (ASTM International)
 - 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))

1.03 SITE CONDITIONS

- A. Protect structures and utilities from damage during earthwork/compaction operations.
- B. Repair or replace damage to existing structures caused by earthwork/compaction operations, at no extra cost to the Owner.

1.04 QUALITY ASSURANCE

- A. The Owner will retain the Engineer to provide quality assurance and testing of earthwork operations.
- B. Notify the Engineer at least three days before starting earthwork/compaction operations.
- C. Submit representative samples and Certification of Origin of each material proposed for use for fill to the Engineer for testing. Individual soil samples must contain at least 30 pounds of material. Do not use material for fill until a sample of that material has been tested and found to comply with the specification requirements.
- D. Allow sufficient time during earthwork/compaction operations for the Engineer to perform the necessary field tests.



PART 2 – PRODUCTS

2.01 EQUIPMENT

- A. Use equipment compatible with the site conditions and backfill material to minimize damage to existing structures and to properly compact material.

PART 3 - EXECUTION

3.01 PLACEMENT AND COMPACTION OF FILL AND BACKFILL

- A. Follow requirements in Section 31 2323.13.
- B. Place individual lifts in horizontal layers of maximum 8-inches where near existing or installed pipe or structure to prevent the thickness of lift from exceeding the specified values.
- C. Maintain the moisture content of the backfill material during compaction within a range extending from 2 percent below optimum moisture content to 2 percent above optimum moisture content as determined by ASTM D1557.
- D. Compact each lift to achieve the maximum dry unit weight defined in Section 31 2323.13, Soil Backfilling, as determined by ASTM D1557.
- E. Do not place additional backfill until the previous lift has been tested and found to be in compliance with the specification requirements.
- F. Continue filling and compaction operations to the finished levels designated on the plans, so that at completion of compaction operations, the surface of the fill is at all points within one-tenth of a foot of the specified levels.
- G. Do not place backfill on frozen material.
- H. Do not use frozen materials for backfill.
- I. Report to the Engineer and repair any damages to existing structures or other elements caused by construction equipment to the Owner's satisfaction and at the Contractor's expense.



3.02 COMPACTION STANDARDS

- A. The terms "maximum unit weight" and "optimum moisture content" used in these Specifications refer to those values as determined by the test strip method for materials containing more than 40 percent retained on the #4 sieve, including processed aggregates and on-site pulverized materials, and by ASTM D1557 for all other materials.

END OF SECTION



SECTION 32 11 23

AGGREGATE BASE AND SURFACE COURSES

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Provide all labor, equipment, materials, supervision, and incidentals necessary to complete the removal of existing aggregate base, as needed, and surface courses as directed by the Engineer and install new aggregate base and surface courses as directed by the Engineer.

1.02 RELATED SECTIONS

- A. Section 01 3000 – Submittal Procedures.
- B. Section 01 4000 - Quality Requirements.
- C. Section 31 2200 - Grading: Preparation of site for base course.
- D. Section 32 1216 - Asphalt Paving: Binder and finish asphalt courses.
- E. Section 32 1313 - Concrete Pavement: Finish concrete surface course.

1.03 REFERENCES

- A. ASTM Standard D98, “Standard Specification for Calcium Chloride,” ASTM International.
- B. ASTM Standard C136, “Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates,” ASTM International.
- C. ASTM Standard D1557, “Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)),” ASTM International.
- D. ASTM Standard D6938, “Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth),” ASTM International.
- E. “Standard Specifications for Construction,” Michigan Department of Transportation (MDOT).



1.04 SUBMITTALS

- A. See Section 01 3000 – Submittal Procedures.
- B. Materials Sources: Submit name(s) of imported materials source(s).
- C. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- D. Product data and samples of proposed geotextile fabrics.

1.05 PROJECT CONDITIONS

- A. Provide sufficient quantities of aggregate to meet project schedule and requirements. When necessary, store materials on site in approved areas in advance of need.
- B. When aggregate materials need to be stored on site, locate stockpiles where indicated.
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.
 - 4. Stockpile so as to permit removal of materials with uniform gradation.
 - 5. Do not permit stockpiles to exceed four feet in depth on the complete subbase or aggregate surface.
- C. Verify that survey benchmarks and intended elevations for the Work are as indicated.

1.06 ENVIRONMENTAL CONDITIONS

- A. Do not place aggregate materials when there are indications that they may become frozen before the maximum unit weight is obtained.
- B. Do not place aggregate on a frozen subgrade or base course, unless otherwise directed by the Engineer.



PART 2 – PRODUCTS

2.01 MATERIALS

- A. Fine Aggregate for Subbase: MDOT 902.07 Class II.
- B. Dense Graded Aggregate for Base: MDOT 902.05 - MDOT 21AA crushed natural aggregate only.
- C. Geotextile Separator Fabric: MDOT 910.03 C, with the physical properties described in MDOT Table 910-1; unless otherwise shown on the Drawings.
- D. Geotextile Stabilizing Fabric: MDOT 910.03 D, with the physical properties described in MDOT Table 910-1; at soft soils where shown on the Drawings or encountered in the field.
 - 1. Use Tensar TriAx 140 or approve equal and follow Tensar TriAx 140 Installation Guide or approved equal.
- E. Water: Clean and free from substances injurious to the finished product. Water from sources approved by the Michigan state Department of Public health as potable may be used.
- F. Calcium Chloride Admixtures are only permitted when approved in advance by the Engineer; Conform to ASTM D98 and MDOT 903.02.

2.02 SOURCE QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of aggregate materials.
- B. If tests indicate materials do not meet specified requirements, change material and retest.
- C. Provide materials of each type from same source throughout the Work.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify substrate has been inspected, grades and elevations are correct, and substrate is dry.



- B. Verify locations of existing improvements, including structures, against which the new work will be placed. Obtain Engineer's approval of adjustments in the line and grade, if necessary, to align the new work with the existing improvements.
- C. Existing Base: Prior to placing aggregate material for surfacing, examine the existing base for grade and condition; verify that it is adequately compacted to receive the aggregate surfacing. Correct defects and deficiencies before proceeding with the Work.

3.02 PREPARATION

- A. Correct irregularities in substrate grades and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place aggregate on soft, muddy, or frozen surfaces.
- C. If the subgrade or subbase remains wet after surface water has been removed, the Engineer may require installation of an edge drain based upon site and soil conditions.
- D. Do not proceed with placement of aggregate material until the subgrade, subbase, or existing aggregate surface has been approved by the Engineer.
- E. Place the geotextile fabric if required, on the subgrade in accordance with manufacturer's instructions.

3.03 INSTALLATION

- A. Comply with MDOT 302.03.
- B. Under Portland Cement Concrete and Bituminous Concrete Paving:
 - 1. Place aggregate base to a total compacted thickness as shown on the Drawings.
 - 2. Compact aggregate base to 95 percent of maximum dry density.
- C. Place aggregate in maximum 6-inch layers and roller compact to specified density.
- D. Level and contour surfaces to elevations and gradients indicated.
- E. Add water to assist compaction.
- F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.



3.04 TOLERANCES

- A. Flatness: Maximum variation of 1/2 inch measured with 10-foot straight edge.
- B. Scheduled Compacted Thickness: Within 1/4 inch.
- C. Variation from Design Elevation: Within 1/2 inch.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.
- B. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D6938 at a rate of one measurement per each 600 square yards.
- C. Moisture content testing will be performed on compacted aggregate base course in accordance with ASTM D 6938 at a rate of one measurement per each 600 square yards.
- D. Locations of test measurements will be determined at the discretion of the Engineer.
- E. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("Modified Proctor").
- F. If tests indicate work does not meet specified requirements, adjust moisture content, recompact and retest. In the event that specified density still cannot be achieved verify that the proper moisture density information is being used for the material and reevaluate test results if warranted. Otherwise remove, replace and recompact the material.
- G. Proof roll compacted aggregate at surfaces that will be under paving and repair, if necessary, at Contractor's expense.

3.06 CLEAN-UP

- A. Remove unused stockpiled materials and leave area in a clean and neat condition. Grade the stockpile area to prevent standing surface water.
- B. Leave the site in a clean and neat condition. Grade the site to prevent standing surface water.

END OF SECTION



SECTION 32 12 13

BOND COATS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Bond Coats (sometimes referred to as Tack Coats)

1.02 REFERENCES

- A. 2020 Standard Specifications for Construction; Michigan Department of Transportation (MDOT), Section 501 and 904.

1.03 SUBMITTALS

- A. See applicable Specification for submittal procedures.
- B. Materials Sources: Submit name and grades of Bond Coat along with source and MDOT acceptance.
- C. Product data on proposed Bond Coat including MDOT approved grades for seasonal use.

1.04 PROJECT CONDITIONS

- A. Provide sufficient quantities of Bond Coat to meet project schedule and requirements.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Bond Coat: MDOT specified asphalt emulsion for Bond Coat in HMA paving; SS-1h or CSS-1h. See Section 501 Plant Produced Hot Mix Asphalt and Section 904 Asphaltic Materials.

2.02 SOURCE QUALITY CONTROL

- A. Submit documentation that Bond Coat is approved for use by MDOT.
- B. If tests indicate materials do not meet specified requirements, change material and retest.
- C. Provide materials of each type from same source throughout the Work.



PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that HMA base or leveling course has been inspected, grades and elevations are correct, and approved for placement of leveling or top course of asphalt.

3.02 PREPARATION

- A. Do not place Bond Coat on heavily soiled and/or muddy base course.
- B. Clean base course to an acceptable condition approved by the Engineer prior to placement of Bond Coat.

3.03 INSTALLATION

- A. Comply with MDOT Bond Coat, SS-1h, CSS-1h.

3.04 TOLERANCES

- A. Comply with MDOT Section 904

3.05 CLEAN-UP

- A. Leave area in a clean and neat condition.

END OF SECTION



SECTION 32 12 16

ASPHALT PAVING

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Provide all labor, equipment, materials, supervision, and incidentals necessary to complete the installation of bituminous asphalt paving.

1.02 REFERENCES

- A. ASTM Standard C131, “Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine,” ASTM International.
- B. ASTM D244, “Standard Test Methods and Practices for Emulsified Asphalts,” ASTM International.
- C. ASTM D692, “Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures,” ASTM International.
- D. ASTM Standard D946, “Standard Specification for Penetration-Graded Asphalt Binder for Use in Pavement Construction,” ASTM International.
- E. ASTM Standard D1073, “Standard Specification for Fine Aggregate for Bituminous Paving Mixtures,” ASTM International.
- F. ASTM Standard D2026, “Standard Specification for Cutback Asphalt (Slow-Curing Type),” ASTM International.
- G. ASTM Standard D2027, “Standard Specification for Cutback Asphalt (Medium-Curing Type),” ASTM International.
- H. ASTM Standard D2028, “Standard Specification for Cutback Asphalt (Rapid-Curing Type),” ASTM International.
- I. ASTM Standard D4125, “Standard Test Methods for Asphalt Content of Bituminous Mixtures by the Nuclear Method,” ASTM International.
- J. ASTM Standard D6927, “Standard Test method For Marshall Stability and Flow of Asphalt Mixtures,” ASTM International.
- K. “Standard Specifications for Construction,” Michigan Department of Transportation (MDOT).



- L. MTM Method 118, “Michigan Test Method for Measuring Fine Aggregate Angularity,” Manual for the Michigan Test Methods, MDOT.

1.03 SUBMITTALS

- A. Provide certification that the materials used conform to the standards specified in this Section.
- B. Prior to beginning the Work, submit a certified copy of proposed mix design for each type of bituminous mixture used on this Project.
- C. Submit certified batch plant delivery ticket prior to placing each load of materials.

1.04 QUALITY ASSURANCE

- A. Comply with MDOT construction specifications, latest edition, unless specified otherwise herein.
- B. Obtain materials from same source throughout construction.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphalt when precipitation is falling or surface is wet or frozen.
- B. Comply with MDOT 501.03 I for weather and seasonal limitations on placement.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Aggregate for Base Courses, see Section 32 11 23.
- B. Blended Aggregate for Hot-Mixed Asphalt (HMA)
 - 1. Coarse aggregate complying with ASTM D692 and MDOT 902.09.
 - 2. Fine aggregate complying with ASTM D1073 and MDOT 902.09.
 - 3. Provide aggregate blend that conforms to the applicable requirements of MDOT for the mix designs shown on the drawings.
- C. Fine Aggregate for HMA Surface Treatments: MDOT 902.10.
- D. Asphaltic Binder: MDOT 904.



- E. Mineral Filler: MDOT 902.11.
- F. Anti-Foaming Agents: MDOT 904.03A.
- G. Cut-Back Asphalt: MDOT 904.03B and ASTM D 2026, ASTM D 2027, or ASTM D2028.
- H. Emulsified Asphalt: MDOT 904.03C and ASTM D244.
- I. Prime Coat and Bond Coat: Homogeneous, medium curing, liquid asphalt.
- J. Use of Reclaimed Asphalt Pavement (RAP) is permitted up to 25% by binder weight.

2.02 EQUIPMENT

- A. Comply with MDOT 502.03A.
- B. General: Comply with MDOT 501, unless otherwise approved by Owner's Representative.
- C. Combine aggregates, mineral filler (if required), and asphalt binder to produce a hot-mixed asphalt (HMA) that complies with MDOT HMA Selection Guide. Refer to the project drawings for proposed MDOT HMA mixes.
- D. Provide a mixture that meets the requirements for the MDOT mixtures specified when tested at optimum asphalt content in accordance with ASTM D4125.
- E. If the source of any of the aggregate changes, submit and test new mixtures for compliance.
- F. Base mixture proportions on the composite samples of aggregate and the bituminous material shown on the Drawings.

2.03 SOURCE QUALITY CONTROL

- A. Test mix design and samples to verify conformance with MDOT Special Provision for Marshall Hot Mix Asphalt Mixture (03SP501) and/or MDOT Special Provision for Superpave Final Aggregate Blend Requirements (12SP-902E-04).
- B. Maintain uniform gradation of aggregate placed in the cold feed bins so that the combination of aggregates produced by blending the aggregate from two or more cold feed bins will be uniformly fed into the HMA.
 - 1. Use adjustable feeders on the belt that supplies the asphalt plant.



2. Equip feeders with cutoffs that will automatically stop the operations to the asphalt plant whenever the flow of any aggregate fraction is changed so as to affect the uniformity of the finished product.
 3. Hot bins may be used for proportioning of the aggregates to meet the specified tolerances.
- C. After the job-mix formula (JMF) is accepted by the Engineer, maintain the bituminous mixture within the tolerance limits established by the applicable MDOT Special Provisions.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Verify that compacted subgrade is dry, not frozen and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.
- C. Obtain Owner's Representative acceptance of the density, grade and cross-section of the aggregate base prior to placing bituminous base course mixtures directly on the aggregate base.

3.02 BASE COURSE

- A. Preparation of Aggregate Base Course: Section 32 11 23 - Aggregate Base and Surface Courses.

3.03 INSTALLATION – GENERAL

- A. Provide curb drops for sidewalk ramps at street intersections, and for driveway approaches and sidewalks at locations shown on the drawings or where determined by Owner's Representative. Provide curb drops that comply with Act 8 of Michigan PA 1973, "Sidewalks; Persons with Disabilities," as amended.
- B. Protect existing improvements, including structures, to prevent their surfaces from becoming discolored during application of bituminous materials.

3.04 PREPARATION - PRIME COAT

- A. Ensure that the aggregate base or subbase to be primed is free from moisture when the treatment is applied.



- B. Apply prime coat on aggregate base by means of a pressure distributor. Hand spraying apparatus may be used to distribute the prime coat only in areas that are inaccessible to the pressure distributor operation.
- C. Apply prime coat at a rate between 0.05 and 0.10 gallons per square yard (225 to 450 ml/m²), or as recommended by the Owner's Representative.
- D. Do not permit pools of bituminous material to remain on the surface.
- E. Permit the prime coat to properly cure before placing HMA. Do not use aggregate to blot excess primer in lieu of proper curing.

3.05 PREPARATION - BOND COAT

- A. Treat each layer of bituminous mixture with bituminous material before placing the succeeding layer.
- B. Apply bond coat on paving by means of a pressure distributor. Hand spraying apparatus may be used to distribute the prime coat only in areas that are inaccessible to the pressure distributor operation.
- C. Apply bond coat at a rate between 0.025 and 0.05 gallons per square yard (112 to 225 ml/m²), or as recommended by the Engineer.
- D. Do not permit pools of bituminous material to remain on the surface.
- E. Apply prime coat ahead of the paving operation for a distance of at least 140 feet (43 m), subject to space limitations and as recommended by Owner's Representative.
- F. Permit the bond coat to properly cure before placing HMA. Do not use aggregate to blot excess primer in lieu of proper curing.
- G. Coat surfaces of manhole frames with oil prior to bond coat placement in the vicinity of the manhole frames to prevent bond with asphalt pavement. Do not bond coat these surfaces.

3.06 TRANSPORTING AND PLACING ASPHALT PAVEMENT

- A. Transport mixtures in accordance with MDOT 501.03 E.
- B. Place HMA in accordance with MDOT 501.03 F.
- C. Roll and compact HMA in accordance with MDOT 501.03 G.
- D. Heating Bituminous Materials



1. Ensure uniform temperature throughout the entire mass of bituminous material that require heating before application, as directed by the Engineer, by using efficient and positive control at all times.
2. Heat bituminous materials to a temperature that is consistent with the type of material used and only to such temperature as required to achieve the necessary fluidity. Avoid excessively high temperatures.
3. Provide a thermometer to enable the Engineer to observe the temperature at any time. Bituminous material that has been overheated will be rejected.
4. Circulate asphalt emulsion continuously when heated above atmospheric temperature so as to prevent it from separating.
5. Heat asphalt emulsion to the required temperature for application in the distributor unless a circulating heater is used in the storage tank to maintain uniform temperature.
6. Asphalt emulsion that has been damaged by continuous heating for too long a time or by alternate heating and cooling will be rejected.

3.07 TOLERANCES

- A. Measure smoothness requirements of base courses and HMA courses in accordance with MDOT 501.03 H for longitudinal, transverse, and diagonal directions.
- B. Compacted Thickness: Within 1/4 inch of specified or indicated total pavement thickness.
- C. Variation from True Elevation: Within 1/4 inch.
- D. If these criteria are not met, the resulting low area (aka “bird bath”) shall be corrected by milling and overlaying or complete removal and replacement of the affected areas. Surface patching is not acceptable.

3.08 FIELD QUALITY CONTROL

- A. General: Comply with MDOT for testing procedures and Section 01 40 00 for quality requirements.
 1. Aggregate gradation tests will be performed on aggregate extracted from samples of bituminous mixture taken from the trucks as directed by the Engineer.
 2. Samples will be taken at the start of production and at other times when tests indicate that the aggregate gradation is fluctuating. At these times, truck samples will be taken at a frequency of one sample per 250 tons (225 metric tons) of mixture, but not more than four samples per day.



3. During periods when tests indicate the aggregate gradation is stable, truck samples will be taken at a frequency of one sample per 500 tons (450 metric tons) of mixture, but no more than two samples per day.
- B. Mixtures that exceed the permitted deviations listed in the MDOT Special Provisions will be rejected and the Contractor shall be required to remove and replace bituminous pavement that were determined by the Owner's Representative to be constructed with mixtures that exceeded the permitted deviations.
- C. Roll HMA until the required compaction is attained. Base the required amount of rolling on 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 (900 metric tons), use the nuclear gage method to govern compaction requirements.
- D. Determine the control density for the bituminous mixture to be placed by using the modified Marshall Test in accordance with ASTM D 6927.

3.09 PROTECTION AND CLEAN-UP

- A. Immediately after placement, protect pavement from mechanical injury until surface temperature is less than 140 degrees F.
- B. Backfill the area adjacent to the new Work with sound earth of topsoil quality. Comply with Sections 31 22 00 and 31 23 23.13.
- C. Leave backfill compacted, leveled to achieve positive drainage and in a neat, workmanlike condition.
- D. At a seasonally correct time, rake the disturbed area, place topsoil thereon, and restore the area.

END OF SECTION



SECTION 32 13 13

CONCRETE PAVEMENT

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Provide all labor, equipment, materials, supervision, and incidentals necessary to complete the construction of concrete pavement for sidewalks, guardrail foundations, curbs, gutters, parking areas, roads/drives, concrete box-outs, and all other incidental concrete shown on the plans.
- B. Furnish all materials, including dowels, tie bars and joint materials; and furnish all equipment, tools, labor, and work incidental to placing, curing, and protection of the concrete; and construct the pavement complete.

1.02 REFERENCES

- A. ASTM International:
 - 1. ASTM C31, “Practice for Making and Curing Concrete Test Specimens in the Field”
 - 2. ASTM C33, “Standard Specification for Concrete Aggregates
 - 3. ASTM C39, “Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens”
 - 4. ASTM C94, “Standard Specification for Ready-Mixed Concrete”
 - 5. ASTM C109, “Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)”
 - 6. ASTM C114, “Standard Test Method for Chemical Analysis of Hydraulic Cement”
 - 7. ASTM C138, “Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete”
 - 8. ASTM C143, “Standard Test Method for Slump of Hydraulic-Cement Concrete”
 - 9. ASTM C150, “Standard Specification for Portland Cement”
 - 10. ASTM C172, “Standard Method of Sampling Freshly Mixed Concrete”
 - 11. ASTM C173, “Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method”
 - 12. ASTM C231, “Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method”
 - 13. ASTM C260, “Standard Specification for Air-Entraining Admixtures for Concrete”
 - 14. ASTM C309, “Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete”
 - 15. ASTM C311, “Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete”
 - 16. ASTM C457, “Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete”
 - 17. ASTM C494, “Standard Specification for Chemical Admixtures for Concrete”



18. ASTM C595, "Standard Specification for Blended Hydraulic Cements"
 19. ASTM C618, "Standard Specification for Coal Fly Ash or Calcined Natural Pozzolan for Use in Concrete"
 20. ASTM C685, "Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing"
 21. ASTM C823, "Standard Practice for Examination and Sampling of Hardened Concrete in Construction"
 22. ASTM C856, "Standard Practice for Petrographic Examination of Hardened Concrete"
 23. ASTM C989, "Standard Specification for Slag Cement in Use in Concrete and Mortars"
 24. ASTM C1077, "Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation"
 25. ASTM Standard C1116, "Standard Specification for Fiber-Reinforced Concrete"
 26. ASTM C1157, "Standard Performance Specification for Hydraulic Cement"
 27. ASTM C1222, "Standard Practice for Evaluation of Laboratories Testing Hydraulic Cement"
 28. ASTM C1240, "Standard Specification for Silica Fume Used in Cementitious Mixtures"
 29. ASTM C1260, "Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)"
 30. ASTM C1293, "Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction"
 31. ASTM C1567, "Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Test)"
 32. ASTM D98, "Standard Specification for Calcium Chloride"
 33. ASTM D994, "Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)"
 34. ASTM D1751, "Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)"
 35. ASTM D5249, "Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints"
 36. ASTM D6690, "Standard Specification for Joint and Crack Sealants, Hot-Applied, for Concrete and Asphalt Pavements"
- B. Michigan Department of Transportation (MDOT): Standard Specifications for Construction
- C. American Concrete Institute (ACI):
1. ACI 117.1 "Guide for Tolerance Compatibility in Concrete Construction"
 2. ACI 201, "Guide to Durable Concrete"
 3. ACI 211.1, "Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete"
 4. ACI 301, "Specifications for Structural Concrete"
 5. ACI 304R, "Guide for Measuring, Mixing, Transporting, and Placing Concrete"
 6. ACI 305R, "Guide to Hot Weather Concreting"
 7. ACI 306R, "Guide to Cold Weather Concreting"



D. Metric Conversions:

Inch-pound unit	Factor	SI unit
in.	x 25.4	= mm
lb/yd ³	x 0.5933	= Kg/m ³
psi	x 0.006895	= Mpa
temperature, °F	(°F - 32)/1.8	= °C

1.03 SUBMITTALS

- A. Provide the following information in initial submittals: Whenever material sources or relevant properties of the materials change, provide a re-submittal of the relevant information, demonstrating compliance with the applicable provisions.
1. List of sources for materials.
 2. Material certifications for each material.
 3. Product data for curing compound, including installation instructions, joint filler, and admixtures.
 4. Proposed concrete mix design in accordance with ACI 301.
 5. Contractor's quality control plan.
- B. Submit the concrete mix design to the Engineer a minimum of ten (10) business days prior to placing concrete. Develop proportions for normal weight concrete mixtures in accordance with ACI 211.1 to meet the requirements of ACI 301. Include the following information for each concrete mix design:
1. Grading of fine and coarse aggregates
 2. Proportions of all ingredients including admixtures added either at the time of batching or at the job site
 3. Water/cement ratio
 4. Slump
 5. Air content of freshly mixed concrete by the pressure method
 6. Unit weight of concrete
 7. Strength at 7 and 28 days
 8. Chloride content



9. Total alkali content of the cementitious materials
 10. Test results, not more than 1 year old that verify the selected materials and relative proportions are adequate to mitigate the risk of alkali-silica reactivity, as required by Article 2.02 G.
- C. Laboratory Qualifications: For each laboratory that supplies test reports or data required by this specification, provide evidence that the laboratory is properly equipped and qualified, in accordance with ASTM C 1077 and C 1222, to perform the tests method(s) on which they are reporting.
- D. Samples: Submit representative samples of the following products and materials:
1. Fine aggregate
 2. Coarse aggregate
 3. Expansion joint filler
 4. Contraction joint filler
 5. Hot-poured joint sealant
 6. Backer rod
- E. If work will be performed during cold weather conditions, submit detailed procedures for production, transportation, placement, protection, curing, and temperature monitoring of concrete during cold weather. In the submittal, include procedures to be implemented upon abrupt changes in weather conditions or equipment failures.
- F. If work will be performed during hot weather conditions, submit detailed procedures for production, transportation, placement, protection, curing, and temperature monitoring of concrete during hot weather. In the submittal, include procedures to be implemented upon abrupt changes in weather conditions or equipment failures.

10.4 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301.
- B. Provide Owner's quality control testing agency with access to stockpiles, quarries, bulk storage bins, ready-mix facility, etc. for the purpose of obtaining samples of materials used in the concrete mix.
1. Furnish labor to assist testing agency in obtaining and handling samples at the job site.
 2. Advise testing agency in advance (minimum of 48 hours) of operations to allow for the assignment of testing personnel and testing.
 3. Provide and maintain adequate facilities for the use of the testing agency for proper curing of concrete test specimens on the project site in accordance with "Standard Method of Making and Curing Concrete Test Specimens in the Field," ASTM C31.
- C. Materials and operations will be tested and inspected as work progresses. Failure to detect defective work shall not prevent rejection when defect is discovered, nor shall it obligate the Owner for final acceptance.



- D. The following testing services will be performed by a third-party testing agency, as designated and compensated by the Owner:
1. For each mix design, make one strength test for each 100 cubic yards or fraction thereof of concrete placed in any one day.
 2. Secure composite samples in accordance with "Standard Method of Sampling Freshly Mixed Concrete", ASTM C172.
 3. For each required strength test, mold and cure six (6) specimens in accordance with "Standard Method of Making and Curing Concrete Test Specimens in the Field", ASTM C31.
 4. Test specimens in accordance with "Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens", ASTM C39. Two specimens will be tested at 28 days for acceptance, one tested at 7 and 14 days for information and two retained as spares.
 5. For each strength test, determine slump of concrete sample in accordance with "Standard Test Method for Slump of Portland Cement Concrete", ASTM C143.
 6. For each strength test, determine total air content of concrete sample in accordance with "Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method", ASTM D231.
 7. For each strength test, determine temperature, unit weight, yield and air content (gravimetric) of concrete sample in compliance with ASTM C138, "Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete".
- E. If test results indicate deficient compressive strength, a negative pay adjustment in the unit price of concrete pavement shall be made in accordance with Article 1.01.C.
- F. Delivered concrete may be rejected at the job site prior to placement due to any of the following:
1. Concrete fails to conform to submitted and approved concrete mix design.
 2. Failure of concrete samples obtained from the first or middle portion of the delivered concrete load to meet required concrete qualities outlined in Article 2.02.
 3. Placement of the delivered concrete load did not begin within 45 minutes from ready-mix concrete plant batch time.
 4. More than 90 minutes have elapsed between ready-mix concrete plant batch time and concrete placement.

1.05 PROJECT CONDITIONS

A. Environmental Requirements



1. Cold Weather Concreting: Comply with ACI 306R and the following:
 - a. Do not use admixtures or accelerators unless approved in advance by the Engineer.
 - b. Protect the subgrade from freezing by covering it with a layer of 12 inches to 24 inches of hay, straw, or insulating blankets covered with waterproof canvas or sheeting.
 - c. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.
 - d. Concrete Temperature As-Mixed: Provide as-mixed concrete temperature that is not less than the following, depending upon the ambient temperature:
 - i. 60 degrees F when the ambient temperature is above 30 degrees F;
 - ii. 65 degrees F when the ambient temperature is between 0- and 30-degrees F; and
 - iii. 70 degrees F when the ambient temperature is below 0 degrees F.
 - e. Placement: Do not place concrete that is less than 60 degrees F nor more than 90 degrees F.
 - f. Protection: Unless otherwise specified, maintain the minimum temperature of concrete at 60 degrees F. Temperatures specified to be maintained during the protection period are those measured at the concrete surface, whether the surface is in contact with formwork, insulation, or air. Measure the temperature with a surface temperature measuring device having an accuracy of +/- 2 degrees F. Measure the temperature of concrete in each placement at regular time intervals.
 - g. Protection against freezing: Cure and protect concrete against damage from freezing for a minimum period of 3 days, unless otherwise specified. Maintain the minimum specified surface temperature of the concrete during that period.
 - h. The protection period may be reduced to 2 days if one or more of the following is used to alter the concrete mixture and is approved by the Engineer:
 - i. Type III portland cement, meeting the requirements of ASTM C150, is substituted for the Type I portland cement.
 - ii. A strength accelerating admixture, meeting the requirements of ASTM C494, is added.
 - i. After Termination of Protection: Do not permit the surface temperature of the concrete to decrease in temperature more than 50 degrees F in a 24 hours period.
 - j. During periods not defined as cold weather, but when freezing temperatures may occur, protect concrete surfaces against freezing for the first 24 hours after placing.
 - k. Protection Deficiency: If the temperature requirements during the specified protection period are not met, but the concrete was prevented from freezing, continue protection until twice the deficiency of protection in degree-hours is made up. Deficient degree-hours may be determined by multiplying the average deficiency in temperature by the number of hours the temperature was below 60 degrees F.
 - l. Curing of Concrete: Prevent concrete from drying during the required curing period.



2. Hot Weather Concreting: Comply with ACI 305R and the following:
 - a. Provide temperature of concrete, (as placed), that is not so high as to cause difficulty from loss of slump, flash set, or cold joints, and does not exceed 90 degrees F. When the temperature of concrete exceeds 90 degrees F, undertake precautionary measures approved by the Engineer. When the temperature of steel forms is greater than 120 degrees F, spray the forms with water just prior to placing concrete.
 - b. Cool concrete ingredients before mixing. Flake ice, or well-crushed ice of size that will melt completely during mixing, may be substituted for all or part of the mixing water if low slump, flash set or cold joints are encountered due to high temperature.

B. Protection against Rain

1. Protect new concrete from the effects of rain until the concrete has sufficiently hardened.
2. Use burlap or 6-mil polyethylene to cover and protect one day's work.
3. After rain has stopped, remove the covering and burlap-drag the surface. Apply curing compound where the previously applied compound has been disturbed or washed away.

1.06 PAY ITEMS

- A. Concrete pay items, both critical and non-critical as defined by MDOT, are subject to Quality Control testing by the Owner, unless otherwise noted.
- B. No concrete pay items are eligible for or subject to positive pay adjustments. All concrete pay items are subject to negative pay adjustments, in accordance with Table 1 and Table 2.

Table 1: Constructed Concrete Thickness

Amount Less Than Required Thickness	Percent of Reduction in Unit Price
0" to 1/4" (0 to 5 mm)	None
more than 1/4", but not exceeding 1/2" (56 mm to 10 mm)	20
more than 1/2", but not exceeding 1" (03 mm to 25 mm)	50
more than 1" (greater than 25 mm)	Remove and replace



Table 2: Constructed Concrete Compressive Strength

Under Required Compressive Strength	Percent of Reduction in Unit Price
0 to 150 psi (0 to 1 MPa)	None
more than 150 psi, but not exceeding 300 psi (1 MPa to 2 MPa)	20
more than 300 psi, but not exceeding 500 psi (2 MPa to 3.5 MPa)	50
more than 500 psi (greater than 3.5 MPa)	Remove and replace

- C. Reductions in the unit price are additive; that is, if an area of concrete is deficient by 3/8 inch (9 mm) and is under strength by 200 psi (1.4 MPa), the total reduction is 20% plus 20% for a total reduction of 40%.
- D. The deficient area of concrete identified by a core shall be confirmed by drilling and testing two additional cores, one on each side of the deficient core and 20 feet (6 m) from it, when possible. This extra core drilling and testing shall be at the Contractor's expense.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Aggregates: Conform to the requirements of ASTM C 33, MDOT 902, and this specification.
1. Fine Aggregates:
- Clean, hard, durable, uncoated particles of natural sand, free from lumps of clay, soft or flaky material and, at the time of use, free from crusts of hard or frozen material.
 - Natural Sand 2NS consisting of fine granular material resulting from the natural disintegration of rock; free from organic impurities (when measured by subjecting to the sodium hydroxide colorimetric test, produced color shall not be darker than light brown).



- c. The following gradation represents the extreme limits of suitability for use from all sources of supply (MDOT "2NS", Table 902-4):

<u>SIEVE ANALYSIS</u> <u>(MTM 109)</u>	<u>TOTAL % PASSING</u> <u>BY WEIGHT</u>
3/8 in	100
No. 4	95-100
No. 8	65-95
No. 16	35-75
No. 30	20-55
No. 50	10-30
No. 100	0-10
Loss by Washing (No. 200)*	0-3

* Michigan Test Method, MTM 108

- d. Provide fine aggregate with reasonably uniform gradation from any one source and not exhibiting the extreme percentage of gradation specified above. Fine aggregate from any one source having a variation in fineness modulus greater than 0.20 more than or less than the fineness modulus of the representative sample will be rejected.

2. Coarse Aggregate:

- a. Hard, strong, durable, pebbles, crushed natural stone, free from adherent coatings, clay lumps, coal and lignite and other foreign matters. Chert (excluding sound gravels) or other nondurable particles shall not exceed 3% by weight.
- b. Coarse aggregate derived from crushed concrete is not permitted.
- c. Uniformly graded within the following limits (MDOT "6AA", Table 902-1):

<u>SIEVE ANALYSIS</u> <u>(MTM 109)</u>	<u>TOTAL % PASSING</u> <u>BY WEIGHT</u>
1-1/2 in	100
1 in	95-100
1/2 in	30-60
No. 4	0-8
Loss by Washing (No. 200)*	1.0 Max**

* Michigan Test Method, MTM 108

** Loss by washing of 2.0 percent for material produced entirely by crushing rock, boulders, cobbles or concrete.

B. Cementitious Materials:

1. Portland cement, ASTM C150, Type I, Type II, or Type III
2. Slag cement, MDOT 901.06 and ASTM C 989 Grade 100 or Grade 120
3. Fly ash, MDOT 901.07 and ASTM C 618, Class F



4. Blended hydraulic cement, ASTM C 595 or ASTM C 1157
 5. Silica fume, MDOT 901.08 and ASTM C1240
- C. Water: MDOT 911; Clean, potable, low-alkali content (maximum 80 parts per million), and free amounts of oils, acids, alkalis, salts, organic materials, or other substances that are deleterious to concrete or metal in the concrete.
- D. Admixtures: Conform to the following:
1. Air Entrainment: MDOT 903.01 and ASTM C 260
 2. Water Reducing: MDOT 903.02 and ASTM C 494, Type A
 3. Accelerators: MDOT 903.02 and ASTM C 494, Type C
 4. Calcium Chloride: Not permitted
- E. Polypropylene Fibers: Fiber Reinforced Concrete shall consist of a blend of high-performance co-polymer macro fibers and polypropylene microfibers.
- The macros shall be made of 100% virgin co-polymers containing no reprocessed olefin materials, 2" in length with a denier of 4500 and a minimum tensile strength of 75 ksi. The micro portion shall be multi-length with "1/2 and 3/4" virgin polypropylene fibers and both types shall meet the requirements of ASTM C-1116 Type III.
- F. Curing Materials:
1. White pigmented, impervious membrane curing compound: MDOT 903.06A and ASTM C 309, Type 2, Class B Vehicle, with the following additions:
 - a. Base tests for moisture retention, reflectance, and drying time on curing compound application rate of 200 square feet per gallon (5 square meters per liter).
 - b. Allow three weeks from the time of sampling before reporting results.
 - c. Store the compound in clean containers.
 2. Insulating Blankets: MDOT 903.07C and Federal Specifications HH-1-521e, minimum 2 inches thick, minimum R-Value of 7.0 (°F*hr.*ft²/Btu) per inch, and enveloping membranes.
- G. Joint Materials:
1. Expansion joints: Pre-molded, non-extruding bituminous fiber conforming to MDOT 914.03 and ASTM D1751 (AASHTO M 59).
 2. Contraction or Weakened Plane Joints: Pre-molded filler conforming to ASTM D994 (AASHTO M 33).
 3. Hot-Poured Joint Sealant: ASTM D6690 with exceptions specified in MDOT Section 914.04.A.
 4. Backer Rod for Use with Hot-Poured Joint Sealant: Solid, round, heat resistant, closed-cell, cross-linked polyethylene foam rod conforming to MDOT 914.04B and ASTM D5249, Type I.
- H. Reinforcement: Section 03 2000.



I. Smooth Dowel Bars for Transverse Expansion and Contraction Joints: MDOT 914.07.

J. Devices for Transverse End-of-Pour Joints: MDOT 914.08.

2.02 CONCRETE MIX

A. Mix concrete in accordance with ASTM C94.

B. Proportion concrete by weighing and in conformance to the following table, unless otherwise directed by the Engineer:

1.	Compressive Strength:	4,000 psi at 28 days
2.	Maximum water/cementitious ratio:	0.45
3.	Air content:	5.5% plus or minus 1.5%
4.	Slump:	3 inches plus or minus 1 inch
5.	Minimum Cementitious Content:	611 lbs./cy
6.	Maximum size of aggregate:	1-1/2 inch
7.	Maximum water-soluble chloride ion :	0.15% content in hardened concrete of percent by weight of concrete.
8.	Polypropylene Macro Fiber Content:	0.15% (by volume) /cy of concrete

C. Add air entrainment agent to produce a total air content of 5.5% +/- 1.5% at the point of placement and an air void system with the following characteristics when evaluated in accordance with ASTM C457:

1. Spacing factor less than 0.008 inch.
2. Specific surface: at least 600 square inch per cubic inch of air void volume.
3. Voids per linear inch at least 1-1/2 to 2 times greater than the air content percentage.

D. Provide slump as described above when tested in accordance with ASTM C143 unless otherwise directed by the Engineer and except for hand placement. Slump not more than 4 inches for concrete that is hand-placed.

E. Add mixing water at the batch plant only. Do not add water at the job site unless authorized by the Engineer. When authorized to add water at the job site, do not add water more than one time. Adding water and the result on concrete is the responsibility of the Contractor.

F. Slag cement, fly ash, silica fume, and/or blended cement may be used as a partial replacement for Portland cement provided that testing confirms that the as-designed mixture, using the specific materials and sources contemplated for the project, complies with the requirements of this Article 2.02, including the requirement for adequate mitigation of risk of alkali-silica reactivity.

1. The maximum permitted replacement of Portland cement with slag cement is 40% by weight of the total cementitious material (portland cement plus slag cement). Slag must not be from open hearth furnace.



2. The maximum permitted replacement of Portland cement with fly ash is 25% by weight of the total cementitious material (portland cement plus fly ash).
 3. The maximum permitted replacement of Portland cement with supplementary cementitious materials is 40% by weight of the total cementitious material.
 4. The total alkali content of the cementitious materials shall not exceed 3.5 pounds per cubic yard, when evaluated in accordance with ASTM C114 and ASTM C311.
- G. Perform preconstruction testing or provide current testing of similar mix to be utilized for this job to verify that the proposed combination of aggregates and cementitious materials will be adequate to mitigate the risk of alkali-silica reactivity (ASR).
1. Evaluate fine and coarse aggregate by a minimum of two tests each in accordance with ASTM C1260.
 - a. Aggregate sources that exhibit ASTM C1260 mean mortar bar expansion less than 0.10% at 16 days will be considered acceptable and no further testing for ASR mitigation will be required.
 - b. Aggregate sources that exhibit ASTM C1260 mean mortar bar expansion equal to or greater than 0.10% at 16 days will be considered potentially reactive and unacceptable.
 2. If the aggregate is reactive, evaluate the effectiveness of the proposed pozzolans and ground granulated blast-furnace slag to control deleterious ASR by conducting a minimum of two tests in accordance with ASTM C1567.
 - a. If the ASTM C1567 mean mortar bar expansion is less than 0.10% at 16 days, the tested combination of cement replacements and aggregate will be considered acceptable and no further testing for ASR mitigation will be required.
 - b. If the ASTM C1567 mean mortar bar expansion is equal to or greater than 0.10% at 16 days, the tested combination of cement replacements and aggregate will be considered indicative of potentially deleterious expansion and unacceptable.
 - c. Acceptable test results in accordance with ASTM C1567 will be accepted in lieu of testing in accordance with ASTM C1260.

2.03 EQUIPMENT

- A. Finishing Machine: Power driven and of an approved type that will strike-off and compact the concrete with a screening and troweling action.
- B. Forms: Metal, of an approved section that will ensure their rigidity under the impact, thrust, and weight of the heaviest machine carried on them.
 1. Minimum length of 10 feet and a depth not less than the edge thickness of the work prescribed; width of the base in direct bearing on the soil not less than 8 inches; at least three stake pockets for each 10-foot section of form.



2. Straight, free from distortion and showing no vertical variation greater than 1/8-inch in 10-foot lengths from the true plan surface on the top of the form when tested with a 10-foot straight edge.
 3. Connect form sections with a locked joint that is free from vertical movement in excess of 1/8-inch and free from horizontal movement in excess of one-quarter of an inch under the impact, thrust and weight of the heaviest machine carried on forms.
 4. Provide sufficient forms so that it will not be necessary to remove them in less than 12 hours, or longer if required, after the concrete has been placed.
- C. Water Supply: Provide pumps and pipelines with sufficient capacity and nature to ensure an ample supply and adequate pressure of water, simultaneously, for all the requirements of machinery, mixing, curing, sprinkling, subgrade and all other requirements of the work. Water may be supplied in approved tank wagons.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Smooth, trim and compact the subgrade to the required line, grade and cross-section. Thoroughly compact the subgrade, between lines at least 12 inches outside of each edge of the proposed pavement, by rolling with a roller of an approved type weighing not less than 5 tons.
- B. Ensure that the subgrade is moist at the time of placing concrete. If the subgrade becomes dry before the concrete is placed, sprinkle the subgrade with water using a method of sprinkling that does not permit pools of water to form on the subgrade. Do not place the concrete on muddy, soft or frozen subgrade.
- C. Restore and thoroughly compact rutting and other displacement caused by material hauling equipment or by the paver, for a distance of at least 100 feet ahead of the subgrade planer. Maintain the remainder of the prepared subgrade in its compacted state and true to the required grade and cross-section.
- D. Place the concrete forms in advance of placing concrete. Substantially bring the foundation on which the forms are to be placed to the proper grade. Do not place forms on dikes or mounds. Where feasible, bring the subgrade to the approximate required cross-section by means of a subgrade machine.
- E. Check forms for line and grade in advance of placing concrete. Adequately stake and brace forms to resist the pressure of the concrete and the thrust of any equipment traveling on them. Provide uniform bearing on the subgrade throughout the forms' entire length and width. Finish the entire width of the subgrade and thoroughly compact it for a sufficient distance outside the area required for the pavement in order to adequately support the forms. Place forms in direct contact with the subgrade. After the forms have been set to grade, thoroughly compacted, both inside and outside, by use of an approved mechanical form tamper. Joint all forms neatly and tightly, securely stake by at least three stakes per form, and thoroughly clean and oil forms before concrete is placed against them.



- F. After the forms are set in place, check their top surface for grade and trueness with a straight edge not less than 10 feet long. Reset or move any forms showing a variance greater than 1/8 inch in 10 feet.
- G. Coat the surfaces of manhole frames with oil to prevent bond with concrete pavement.

3.02 CONSTRUCTION

- A. Except as modified herein, comply with MDOT Section 602.03 and ACI 304R.
- B. Mixing:
 - 1. On the project site, mix in drum type batch mixer, complying with ASTM C685. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.
 - 2. Transit mixers: Comply with ASTM C94.
- C. Placing Concrete:
 - 1. Do not proceed with concrete placement until the conditions of the subgrade/subbase are approved by the Engineer.
 - 2. Distribute or spread the concrete as soon as placed. Deposit concrete on the subgrade so as to require as little handling as possible and to avoid segregation and separation of the materials. Distribute concrete to such depth and sufficiently above grade so that when consolidated and finished, the surface conforms to the required finished grade. Consolidate the concrete along the faces of the forms and adjacent to joints. Consolidate concrete with an approved vibrator to fill all voids and finish to ensure a dense smooth surface.
 - 3. Deposit and spread concrete continuously, as far as possible between transverse joints. In the case of a temporary shutdown, cover the concrete at the unfinished end of the slab with wet burlap. In the event of an unavoidable interruption of the work continuing more than 30 minutes, place a construction joint, provided the section is 10 feet or more in length between joints. Remove sections less than 10 feet in length at no expense to Owner.
- D. Tie Bars, Dowels and J-Bolts: Place tie bars and dowels at the required depth parallel to the finished surface, perpendicular to the joints and at the uniform spacing shown on the Drawings. Use approved chairs or dowel baskets to support the tie bars or dowels in place or use approved mechanical devices; do not place tie bars or dowels by hand methods.
- E. Joints:
 - 1. Construct all joints with faces perpendicular to the surface of the pavement. Construct transverse joints at right angles to the centerline of the pavement, unless indicated otherwise on the Drawings. Do not permit transverse joints to vary more than 1/4 inch from a true line.



Construct longitudinal joints along or parallel to the centerline of the pavement, unless indicated otherwise on the Drawings. Do not permit longitudinal joints to vary more than one-quarter (1/4") inch from their true designated positions.

2. Finish the pavement surface adjacent to all joints to a true surface. Where indicated on the Drawings, edge the surface adjacent to joints to the radius shown. Test the surface across the joints with a 10-foot straight edge as the joints are finished, and correct irregularities before the concrete has hardened.
3. Longitudinal Joints: Bulkhead construction joints or contraction joints, as shown on the Drawings.
 - a. Provide a keyway in the bulkhead construction joints.
 - b. Accurately form keyways with templates of metal, wood, or other approved material.
 - c. Provide the gauge or thickness of the template material to form the full keyway as specified.
4. Transverse Joints: Contraction joints, expansion joints or construction joints.
5. Contraction Joints: Transverse contraction joints are without tie bars. Locate transverse contraction joints at 24 to 30 times the pavement thickness, except do not exceed a maximum spacing of 15 feet. Provide tie bars in longitudinal contraction joints. Form contraction joints by saw cutting to a depth of 1/3 of the pavement thickness. Perform additional saw cutting to form 1/4-inch wide by 1/2-inch deep sealant reservoir at the top of the contraction joint. Where pavement under construction is adjacent to an existing pavement, construct contraction joints in line with similar joints in the abutting pavement.
 - a. Provide tie bars in longitudinal contraction joints, of length and size shown on the Drawings.
 - b. Embed tie bars on each side of the longitudinal contraction joint as shown on the Drawings and locate at the centerline of the concrete pavement thickness.
 - c. Space tie bars in longitudinal contraction joints as shown on the Drawings.
6. Expansion Joints: One (1") thick and placed every 600 feet, unless shown otherwise in the Drawings. Where the pavement under construction is adjacent to an existing pavement, construct expansion joints in line with the expansion joints in the abutting pavement.
 - a. Provide expansion joints at right angles to the centerline, perpendicular to the surface of the finished pavement and extended entirely through the concrete. Provide smooth dowels, of length and size shown on the Drawings, with expansion cap on one end. Embed dowels a minimum on each side of the expansion joint as shown on the Drawings and locate at the centerline of the concrete pavement thickness. Space dowels in expansion joints as shown on the Drawings.
 - b. During installation, maintain the joint filler in place by an approved installing device that is securely staked. Maintain the top of the joint filler at not less than 1/2 inch or more than 3/4 inch below the finished surface.



- Cover the top of the joint filler with an approved metal cap before the concrete is placed.
- c. Shape the metal cap to the finished crown of the pavement. Provide a metal cap that will not warp or twist out of shape. Keep the cap in place during finishing machine operations.
 - d. Place concrete simultaneously against the dowels and joint filler to a depth approximately equal to the depth of the finished pavement. Thoroughly consolidate concrete with vibration tools. Carefully remove the installing device so that the joint filler and caps are not disturbed.
7. Construction Joints: Form construction joints with dowels whenever an unavoidable interruption of the work constituting a shutdown of more than 30 minutes has occurred, or when directed by the Engineer. Strike the concrete and finish to the bulkhead.
- a. Saw cut to form minimum 1/4-inch wide by 1/2-inch deep sealant reservoir at the top of the construction joint, or as shown on the Drawings.
 - b. Provide dowels, of length and size shown on the Drawings, in construction joints. Embed dowels on each side of the joint as shown on the Drawings and locate at the centerline of the concrete pavement thickness. Space dowels in construction joints as shown on the Drawings.
8. Clean the sealant reservoirs of all extraneous matter. Ensure that the contact faces of the joints are dry at the time of filling and sealing. Compressed air jets, wire brushes and such additional equipment as may be necessary to clean the openings and dry the contact faces of the joints will be required.
9. Fill the top of contraction joints, construction joints, and expansion joints and seal with hot, poured sealant before any traffic is permitted on the pavement. Install joint sealant by hand pouring pots, mechanical methods, or any other method that will give satisfactory results. Place sufficient sealant into the joints so that, upon completion of the work, the surface of the sealant will be flush with the surface of the pavement. Do not spill the sealant on exposed surfaces of the concrete. Immediately remove excess sealant on the surface of the concrete pavements. If the sealant subsides to a level below the surface of the slab, place a second application of sealant. When more than one application is required to fill the joint, perform succeeding applications immediately after shrinkage of the previous sealant application has taken place.
- a. Do not place sealant when the air temperature in the shade is less than 50 degrees F, except with the approval of the Engineer.
 - b. Do not permit traffic over the sealed joints until the sealant has hardened sufficiently to resist pickup.
- F. Finishing: After the placement of the concrete, test surface with straight edge and finish with burlap drag and perform final finishing on slabs at catch basins with broom.
- G. Surface Requirements: On the day following placement of the concrete, the pavement will be straight edged by the Engineer. A 10-foot straight edge will be placed parallel to the centerline so as to bridge any depressions and touch high spots. High spots indicated by a variation exceeding 1/8 inch from the straight edge will be plainly marked. Remove high



spots or reduce by rubbing with a carborundum brick and water. If these methods are inadequate to remove the high spots, use an approved surface-grinding machine.

H. Removal of Forms:

1. Do not remove forms from freshly placed concrete until it has set for at least 12 hours. Carefully remove forms so that no damage is done to the edge of the pavement.
2. After the forms have been removed, clean the ends of joints and point honeycombed areas.
3. Cover the sides of the pavement with curing material except where honeycombed areas are to be pointed. Cover areas to be pointed with wet burlap until the pointing is complete, and then cure as specified in Article 3.02 I.

I. Curing:

1. Immediately after finishing operations have been completed and free water has left the surface, completely coat and seal the surface of the slab and curb with a uniform layer of curing compound. Apply the compound in one or two applications, as required by manufacturer instructions. When the compound is applied in two increments, follow the first application with the second application within 30 minutes.
2. Thoroughly agitate the compound to a uniform consistency, with the pigment uniformly suspended, before transferring the compound between containers and before use.
3. Apply the compound in a continuous uniform film by means of mechanical pressure sprayer equipment at the rate stipulated by the compound manufacturer but not less than one gallon per 200 square feet of surface. Use equipment that provides adequate stirring of the compound during application. Hand spray equipment will be permitted for application of the curing compound over the sides of the slab.
4. Provide uniformly painted, solid white surface after application of curing compound. If appearance is blotchy and non-uniform, apply another layer of curing compound.
5. 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, apply a new coat of material to the affected areas equal to that originally applied.
6. Protect the treated surface from injury for a minimum period of seven days. All traffic will be considered injurious to the film of applied compound. A minimum of foot traffic will be permitted on the dried film as necessary to properly carry on the work, provided that any damage to the film is immediately repaired by the application of another coat of the compound.



7. Provide sufficient burlap, cotton, or polyethylene sheet coverings to protect the pavement in case of rain or breakdown of the spray equipment. If any hair checking develops before the curing compound can be applied, perform preliminary curing with wetted burlap or cotton coverings before the curing compound is applied.

8. Cold Weather Curing: Comply with Article 1.06.A.1.

J. Cleanup:

1. After the concrete has gained sufficient strength, but no sooner than twelve hours, remove fixed forms and immediately backfill the spaces on both sides with sound earth of topsoil quality.
2. Compact and level backfill, providing a neat, workmanlike condition.

3.03 FIELD QUALITY CONTROL

- A. Delivery Tickets: With each load of concrete delivered to the jobsite, provide ready-mix concrete producer's delivery tickets in triplicate, one for Contractor, one for Engineer, and one for Owner. Provide the following information on delivery tickets:
1. Date and serial number of tickets.
 2. Name of ready-mixed concrete plant, operator and job location.
 3. Types of cementitious materials, brand names, and proportions.
 4. Types of admixtures, brand names, and dosages.
 5. Aggregate sizes, proportions, and sources.
 6. Specified cement content in bags per cubic yards of concrete or mix number.
 7. Truck number and time dispatched.
 8. Amount of concrete in load, and in cubic yards delivered.
 9. Slump of concrete ordered.
 10. Amount of water added before the truck left the plant.
 11. Water added at the jobsite, if any and if authorized by Engineer, and corresponding slump of concrete. Adding water at the jobsite without authorization by the Engineer is grounds for rejection.
- B. Quality assurance testing, defined in Articles 1.04 C and 1.04 D, will be performed by a testing agency retained by the Owner. This testing is in addition to the quality control program required to be performed by the Contractor.

3.04 PROTECTION

- A. Protect newly laid pavement that is threatened with damage by rain with a covering of burlap or cotton fabric or by other suitable means.
- B. Comply with the hot and cold weather construction requirements in Part 1 of this specification.
- C. The Contractor shall be responsible for the quality and strength of the concrete laid during cold weather. Remove and replace concrete injured by frost action at no expense to the Owner.



D. Opening to traffic:

1. Do not open pavement to traffic until the strength of placed concrete attains 90% the specified design strength and not before 14 days after time of placement, without the written permission of the Engineer.
2. Engineer reserves the right to require that curing operations be discontinued when the concrete has reached 85 percent of the design strength.
3. Opening the pavement traffic will not constitute a final acceptance of the concrete.

END OF SECTION



SECTION 32 13 73

PAVEMENT JOINT SEALANTS

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Provide all labor, materials, equipment, supervision, and incidentals necessary to prepare surfaces and install joint backing and joint sealant.

1.02 REFERENCES

- A. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.
- B. ASTM C 1193 - Standard Guide for Use of Joint Sealants.
- C. ASTM D 1667 - Standard Specification for Flexible Cellular Materials—Poly (Vinyl Chloride) Foam (Closed-Cell).
- D. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
- E. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating sealant chemical characteristics.
- C. Certifications: Letter of certification from sealant manufacturer indicating that sealant product is compatible with the backing materials and joint substrates.

1.04 QUALITY ASSURANCE

- A. Maintain one copy of each referenced document covering installation requirements on site.



- B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- C. Applicator Qualifications: Company specializing in performing the work of this section with minimum five years' experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle materials to comply with manufacturer's written instructions and to prevent deterioration and damage due to moisture, high or low temperatures, contaminants, and other causes.

1.06 PROJECT CONDITIONS

- A. Install sealant under temperature and humidity conditions that are recommended by the sealant manufacturer.
 - 1. Do not install sealants when ambient or substrate temperatures are below 40 degrees F.
 - 2. Do not install sealants when joint substrates are wet.
- B. Do not install sealants when the joint width is less than that allowed by sealant manufacturer for the application indicated.

PART 2 – PRODUCTS

2.01 SEALANTS

- A. Cold-Applied Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C 920, Class 25, Uses T, I, M and A; single component.



1. Subject to compliance with requirements, approved products include:
 - a. Sikasil-728 SL by Sika.
- B. Hot-Applied Paving Sealant: ASTM D6690, single component.
 1. Subject to compliance with requirements, approved products include:
 - a. Roadsaver 221 by Crafco Inc.
 - b. Hot-applied Polymeric Joint Sealant #3405 by W. R. Meadows, Inc.

2.02 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing for Cold-Applied Sealant: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
- C. Joint Backing for Hot-Applied Sealant: ASTM C1751 asphalt saturated fiberboard; thickness and width as required, to control sealant configuration.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work and are compliant with joint configuration and size tolerance requirements.
- B. Verify that joint backing is compatible with sealant.
- C. Do not proceed with sealant installation until unsatisfactory conditions have been corrected.



3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant and effective joint width.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C 1193.
- D. Protect elements surrounding the work of this section from damage or disfigurement.

3.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions, unless more stringent requirements are provided herein.
- B. Perform installation in accordance with ASTM C 1193.
- C. Install backer materials to support sealants during application and at positions required to produce cross-sectional shapes and depths of installed sealant relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of backer materials.
 - 2. Do not stretch, twist, puncture, or tear backer materials.
 - 3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.
- D. Install sealants by proven techniques to comply with the following and at the same time that backer materials are installed:
 - 1. Place sealants so that they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses provided for each joint configuration.



- E. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
 - 1. Width/depth ratio of 2:1.
 - 2. Neck dimension no greater than 1/3 of the joint width.
 - 3. Surface bond area on each side not less than 75 percent of joint width.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- G. Apply sealant within recommended application temperature ranges and weather conditions. Do not apply sealant if these conditions are not expected to prevail until the sealant has cured to a point that it will not be adversely affected. Consult manufacturer when sealant cannot be applied within these temperature ranges and weather conditions.
- H. Tool joints concave in a manner approved by the sealant manufacturer.

3.04 CLEANING

- A. Clean adjacent soiled surfaces as the Work progresses.
- B. Use methods and materials that are approved by the sealant manufacturer.

3.05 PROTECTION OF FINISHED WORK

- A. Protect sealants until cured.
- B. Cut out and replace damaged and deteriorated joint sealants immediately so that repaired areas are indistinguishable from the original work.

END OF SECTION



SECTION 32 17 13

PARKING BUMPERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Precast concrete parking bumpers and anchorage.

1.02 REFERENCES

- A. ASTM Standard A615, "Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement," ASTM International
- B. ASTM Standard C33, "Standard Specification for Concrete Aggregates," ASTM International
- C. ASTM Standard C150, "Standard Specification for Portland Cement," ASTM International
- D. ASTM Standard C260, "Standard Specification for Air-Entraining Admixtures for Concrete," ASTM International

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide unit configuration, dimensions.
- C. Samples: Submit two concrete bumper units, illustrating surface finish.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Parking Bumpers: Precast concrete, conforming to the following:
 - 1. Cement: ASTM C150, Portland Type I - Normal; white color.
 - 2. Concrete Materials: ASTM C33 aggregate, water, and sand.



3. Reinforcing Steel: ASTM A615, deformed steel bars; unfinished finish, strength, and size commensurate with precast unit design.
4. Air Entrainment Admixture: ASTM C260.
5. Concrete Mix: Minimum 4,000 psi, 28-day strength, air entrained to 5 to 7 percent.
6. Use rigid molds, constructed to maintain precast units uniform in shape, size and finish. Maintain consistent quality during manufacture.
7. Embed reinforcing steel, and drill or sleeve for two dowels. Hold reinforcing steel back 3-inches from the ends.
8. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
9. Minor patching in plant is acceptable, providing appearance and performance of units is not impaired.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install units without damage to shape or finish. Replace or repair damaged units.
- B. Install units in alignment with adjacent work.
- C. Fasten units in place with 2 dowels per unit.
- D. Contractor shall provide a 5-year limited warranty on concrete parking bumpers.

END OF SECTION



SECTION 32 17 23.13

PAINTED PAVEMENT MARKINGS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Provide all labor, equipment, materials, supervision, and incidentals necessary to complete pavement markings, including parking bays, crosswalks, arrows, handicapped symbols, curb, and “No Parking” striping and markings.

1.02 REFERENCES

- A. Federal Specification TT-B-1325D, “Beads (Glass Spheres) Retro-Reflective,” Rev. D, 2007.
- B. Federal Specification TT-P-1952, “Paint, Traffic, and Airfield Marking, Waterborne,” Rev. F, 2015.
- C. MPI “Approved Products List,” March 1, 2016, Master Painters Institute.
- D. MPI “Architectural Painting Specification Manual,” current edition, Master Painters Institute.
- E. FHWA MUTCD, “Manual on Uniform Traffic Control Devices for Streets and Highways,” U.S. Department of Transportation, Federal Highway Administration; current edition at <http://mutcd.fhwa.dot.gov>

1.03 SUBMITTALS

- A. See Section 01 30 00 – Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Certificates: Submit for each batch of paint and glass beads stating compliance with specified requirements.
- D. Sample color chips of proposed paint products.



1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver paint in containers of at least 5 gallons accompanied by batch certificate.
- B. Deliver glass beads in containers suitable for handling and strong enough to prevent loss during shipment accompanied by batch certificate.
- C. Store products in manufacturer's unopened packaging until ready for installation, in an area that provides the recommended environmental conditions for storage and a minimum of 30 feet from site buildings.
- D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
- E. Store, mix, and prepare paints only in areas designated for that purpose.
- F. Provide clean cans and buckets for mixing paints and for receiving rags and other waste materials associated with painting. Clean buckets regularly. At the close of each workday, remove used rags and other waste materials associated with painting from the site.
- G. Take precautions to prevent fire in and around painting materials. Provide and maintain appropriate fire extinguishers near paint, paint storage, and mixing areas.

1.05 PROJECT CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.06 EXTRA MATERIALS

- A. Supply two containers (1 gallon each) of each color for Owner's use.



PART 2 - PRODUCTS

2.01 MATERIALS

- A. Line and Zone Marking Paint: MPI No. 97 Latex Traffic Marking Paint; color(s) as indicated.
 - 1. Parking Lots: Yellow
 - 2. Handicapped Symbols: Blue
 - 3. Crosswalks: White
 - 4. Other: Per MMUTCD
- B. Paint for Obliterating Existing Markings: FS TT-P-1952; black for bituminous pavements, gray for Portland cement pavements.
- C. Reflective Glass Beads: FS TT-B-1325, Type I (low index of refraction), Gradation A (coarse, drop-on); with silicone or other suitable waterproofing coating to ensure free flow.
- D. Temporary Marking Tape: Preformed, reflective, pressure sensitive adhesive tape in color(s) required; Contractor is responsible for selection of material of sufficient durability as to perform satisfactorily during period for which its use is required.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.



- C. Obliteration of existing markings using paint is acceptable in lieu of removal; apply the black paint in as many coats as necessary to completely obliterate the existing markings.
- D. Clean surfaces thoroughly prior to installation.
 - 1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.
 - 2. Completely remove rubber deposits, existing paint markings, and other coatings adhering to the pavement, by scraping, wire brushing, sandblasting, mechanical abrasion, or approved chemicals.
 - 3. Sandblasting: Use equipment of size and capacity necessary, providing not less than 150 cfm of air at pressure not less than 90 psi at each nozzle used.
- D. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.
- E. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.
- F. Temporary Pavement Markings: When required or directed by Engineer, apply temporary markings of the color(s), width(s) and length(s) as indicated or directed.
 - 1. After temporary marking has served its purpose, remove temporary marking by carefully controlled sandblasting, approved grinding equipment, or other approved method so that surface to which the marking was applied will not be damaged.
 - 2. At Contractor's option, temporary marking tape may be used in lieu of temporary painted marking; remove unsatisfactory tape and replace with painted markings at no additional cost to Owner.
- G. Do not inter-mix materials of different character or different manufacturer.
- H. Do not thin material except as recommended by paint manufacturer.



3.03 INSTALLATION

- A. Begin pavement marking as soon as practicable after surface has been cleaned and dried. Do not paint wet or damp surfaces.
- B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F or more than 95 degrees F.
- C. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.
- D. Comply with FHWA MUTCD manual (<http://mutcd.fhwa.dot.gov>) for details not shown.
- E. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.
- F. Apply uniformly painted markings of color(s), lengths, and widths as indicated on the drawings true, sharp edges and ends.
 - 1. Apply paint in one coat only. Wait for paint to dry per manufacturers recommendations and then apply a second coat.
 - 2. Wet Film Thickness: 0.015-inch, minimum.
 - 3. Length Tolerance: Plus or minus 2 inches.
 - 4. Width Tolerance: Plus or minus 1/8 inch.
- G. Roadway Traffic Lanes: Use suitable mobile mechanical equipment that provides constant agitation of paint and travels at controlled speeds.
 - 1. Conduct operations in such a manner that necessary traffic can move without hindrance.
 - 2. Place warning signs at the beginning of the wet line, and at points well in advance of the marking equipment for alerting approaching traffic from both directions. Place small flags or other similarly effective small objects near freshly applied markings at frequent intervals to reduce crossing by traffic.
 - 3. If paint does not dry within expected time, discontinue paint operations until cause of slow drying is determined and corrected.



4. Use hand application by pneumatic spray for application of paint in areas where a mobile paint applicator cannot be used.
 5. Distribute glass beads uniformly on the paint lines within ten seconds without any waste, applied at rate per manufacturer recommendation; if the marking equipment does not have a glass bead dispenser, use a separate piece of equipment adjusted and synchronized with the paint applicator; remove and replace markings having faulty distribution of beads.
- H. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.
1. Mark the International Handicapped Symbol at indicated parking spaces.
 2. Hand application by pneumatic spray is acceptable.
 3. Parking space striping dimensions indicated on the Drawings are nominal dimensions. Comply with the following tolerances:
 - a. Parking space length: Plus or minus 2 inches,
 - b. Parking space width or base line dimension: Plus or minus 2 inches,
 - c. Group of parking spaces: Plus or minus 2 inches per run,
 - d. Stripe width: 4 inches plus or minus 1/8 inch, and
 - e. Extend stripes to within 3 inches of walls or other vertical surfaces.
- I. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends of the design and size indicated.

3.04 DRYING, PROTECTION, AND REPLACEMENT

- A. Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked.
- B. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly painted markings.
- C. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer.



- D. Remove and replace markings that are applied at less than minimum material rates; deviate from true alignment; exceed length and width tolerances; or show light spots, smears, or other deficiencies or irregularities.
- E. Remove markings in manner to avoid damage to the surface to which the marking was applied, using carefully controlled sand blasting, approved grinding equipment, or other approved method.
- F. Replace removed markings at no additional cost to Owner.
- G. Clean paint spots and repair damage to other finishes.
- H. Provide attic stock of paint if requested by owner in quantities requested, one of each color utilized.

END OF SECTION



SECTION 32 90 00

SITE RESTORATION

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Provide all labor, equipment, materials, supervision, and incidentals necessary to complete groundcover, topsoil, topsoil amendments, initial maintenance of planting materials.

1.02 REFERENCES

- A. MDOT Section 816, "Turf Establishment," Michigan Department of Transportation Standard Specifications for Construction
- B. MDOT Section 917, "Turf and Landscaping Materials," Michigan Department of Transportation Standard Specifications for Construction

1.03 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations
 - 2. Storage and handling requirements and recommendations
 - 3. Installation methods
- C. Notices: Submit 48-hour written notice prior to turnover to Owner for watering and maintenance.

1.04 WARRANTY

- A. Warrant grass groundcover and rain garden plantings for a period of one year after date of Substantial Completion, against defects including death and unsatisfactory growth and except for defects resulting from neglect by Owner, abuse by others, or natural phenomena. Replace unsatisfactory plant material at end of warranty period at no additional expense to the Owner. One replacement is required.



1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum 2-year experience installing similar products.
- B. Testing: Laboratory testing for suitable soil amendments and fertilizer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products as recommended by supplier until ready for installation.
- B. Handling: Handle materials to avoid damage.

1.07 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside supplier's recommended limits.

1.08 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 2 – PRODUCTS

2.01 VEGETATIVE GROWTH LAYER

- A. Provide earthen material capable of supporting vegetative growth meeting the following requirements:
 - Organic Content: 3% Minimum
 - pH: 6.5-7.5 (Range)
 - Sieve:
 - 100 percent passing 1-inch Screen
 - 95-100 percent passing ½-inch Screen
 - Minimum 40 percent passing No. 100 Screen
- B. Contractor to provide one (1) test result during placement to confirm vegetative growth layer meets the requirements of these specifications.

2.02 SEEDING

- A. Provide Seed Mixture per MDOT Table 816-1 Seed Mix Selection Guide compatible with TUF (Turf Urban Freeway) mixture, with a High Salt Tolerance.
- B. Substitutions: Not Permitted.



2.03 MULCH

- A. Meet the requirements of MDOT 816 for mulch.

2.04 FERTILIZER

- A. Meet the requirements of MDOT 816 Class A for fertilizer.

2.05 WATER

- A. Clean, fresh water, free of substances that could prevent germination/growth of grass seed.

2.06 MATERIALS

- A. Provide materials in accordance with MDOT Section 816, 911, and 917.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install materials in accordance with approved submittals. Install landscape work in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.
- B. Provide maintenance and watering until turnover to Owner for maintenance and watering. Replace damaged materials and dead or unhealthy plants prior to turnover to Owner.
- C. Work shall be performed in accordance with MDOT Standard Specifications for Construction 816: Turf Establishment.



D. VEGETATIVE GROWTH

1. Do not place soil in a frozen condition, or on frozen subgrade.
2. Place material to a uniform depth of 3 inches (minimum).

E. SEEDING

1. Perform seeding and mulching as specified in MDOT 816.03.C.
2. Apply seed mix at a rate of 220 pounds per acre.
3. Perform seeding after April 15 and before October 10 unless approved by the Owner's Representative.
4. Place seed to provide a continuous stand of grass. The Owner or Owner's representative will determine compliance with this requirement.

F. MULCH

1. Apply mulch at a rate of 2 tons per acre within one day after seeding.
2. Roll mulched area, immediately following mulching.

G. FERTILIZER

1. Apply fertilizer at a rate of 176 pounds per acre.

H. WATER

1. Apply water immediately after each area has been seeded and saturate soil to a minimum depth of 4 inches.
2. Provide sufficient watering by means of frequent light watering during seed germination when rainfall is insufficient. At a minimum, apply supplemental water to all seeded areas, daily during germination period so vegetative growth layer remains moist to a minimum depth of 2 inches.

I. CLEAN UP

1. Remove and properly dispose of excess and waste material off site. Clean adjacent paved areas, and remove materials from gutters, curbs, roadways, and catch basins.



3.4 PROTECTION

- A. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION



SECTION 33 46 00

UNDERDRAINAGE

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Filter aggregate and separation fabric and bedding.

1.02 RELATED SECTIONS

- A. Section 31 2316 - Excavation: Excavating for subdrainage system piping and surrounding filter aggregate.

1.03 REFERENCES

- A. ASTM D 2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
- B. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings
- C. AASHTO M252 - Standard Specification for Corrugated Polyethylene Drainage Pipe
- D. Michigan Department of Transportation (MDOT) Standard Specification for Construction.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate dimensions, layout of piping, high and low points of pipe inverts, and gradient of slope between corners and intersections.
- C. Product Data: Provide data on pipe drainage products and pipe accessories.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Project Record Documents: Record location of pipe runs, connections, cleanouts and principal invert elevations.



- F. Samples: Two pieces, minimum 12 inches by 12 inches, of filter fabric.

1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable code for materials and installation of the work of this section.

PART 2 - PRODUCTS

2.01 PIPE MATERIALS

- A. General: Comply with MDOT 404.
- B. Polyvinyl Chloride Pipe: ASTM D2729 or ASTM D2751; MDOT 909.07; Class 40, plain end, 6 inch inside diameter; with required fittings.
- C. HDPE Pipe: Perforated, corrugated high density polyethylene in accordance with AASHTO M252 (4 inch diameter or less). ADS N-12 or approved equal with required fittings.
- D. Use perforated pipe at subdrainage system; unperforated pipe through sleeved walls and at lateral outlets.

2.02 AGGREGATE AND BEDDING

- A. Filter Aggregate and Bedding Material: Open-graded aggregates conforming to MDOT 902.06 34R..

2.03 ACCESSORIES

- A. Pipe Couplings: Solid plastic.
- B. Non-woven Geotextile Separator: MDOT 910.03 A.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout Drawings.



3.02 PREPARATION

- A. Hand trim excavations to required elevations. Correct over-excavation in accordance with Section 31 2323.13.
- B. Remove large stones or other hard matter that could damage drainage piping or impede consistent backfilling or compaction.

3.03 INSTALLATION

- A. Install and join pipe and pipe fittings in accordance with pipe manufacturer's instructions and in accordance with MDOT 404.
- B. Place drainage pipe on clean cut subsoil.
- C. Lay pipe to slope gradients noted on Drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- D. Loosely butt pipe ends. Place joint cover strip 12 inches wide, around pipe diameter centered over joint.
- E. Place pipe with perforations facing down. Mechanically join pipe ends.
- F. Install pipe couplings.
- G. Prior to installing filter aggregate, verify that drain ends are plugged and no sections are collapsed or otherwise obstructed.
- H. Install filter aggregate at sides, over joint covers and top of pipe. Provide top cover compacted thickness of 12 inches.
- I. Place filter fabric over levelled top surface of aggregate cover prior to subsequent backfilling operations.
- J. Place aggregate in maximum 4-inch lifts, consolidating each lift.
- K. Refer to Section 31 2323.23 for compaction requirements. Do not displace or damage pipe when compacting.
- L. Place impervious fill over drainage pipe aggregate cover and compact.
- M. Connect to storm sewer system with unperforated pipe, through installed sleeves.
- N. Coordinate the Work with connection to municipal sewer utility service and trenching.



3.04 FIELD QUALITY CONTROL

- A. Per Specification Section for Quality Requirements: Field inspection and testing.
- B. Request inspection prior to and immediately after placing aggregate cover over pipe.

3.05 PROTECTION

- A. Protect pipe and aggregate cover from damage or displacement until backfilling operation begins.
- B. Remove large stones or other hard matter that could damage drainage piping or impede consistent backfilling or compaction.

3.03 INSTALLATION

- A. Install and join pipe and pipe fittings in accordance with pipe manufacturer's instructions and in accordance with MDOT 404.
- B. Place drainage pipe on clean cut subsoil.
- C. Lay pipe to slope gradients noted on Drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- D. Loosely butt pipe ends. Place joint cover strip 12 inches wide, around pipe diameter centered over joint.
- E. Place pipe with perforations facing down. Mechanically join pipe ends.
- F. Install pipe couplings.
- G. Prior to installing filter aggregate, verify that drain ends are plugged and no sections are collapsed or otherwise obstructed.
- H. Install filter aggregate at sides, over joint covers and top of pipe. Provide top cover compacted thickness of 12 inches.
- I. Place filter fabric over levelled top surface of aggregate cover prior to subsequent backfilling operations.
- J. Place aggregate in maximum 4-inch lifts, consolidating each lift.
- K. Refer to Section 32 2200 for compaction requirements. Do not displace or damage pipe when compacting.



- L. Place impervious fill over drainage pipe aggregate cover and compact.
- M. Connect to storm sewer system with unperforated pipe, through installed sleeves.
- N. Coordinate the Work with connection to municipal sewer utility service and trenching.

3.04 FIELD QUALITY CONTROL

- A. Section 01 4000 - Quality Requirements: Field inspection and testing.
- B. Request inspection prior to and immediately after placing aggregate cover over pipe.

3.05 PROTECTION

- A. Protect pipe and aggregate cover from damage or displacement until backfilling operation begins.

END OF SECTION



APPENDIX A

- **Report on Geotechnical Investigation**



Report on Geotechnical
Pavement Investigation

**Proposed Livonia Public
School Central Office
15125 Farmington Road
Livonia, Michigan 48154**

Latitude 42.395282 ° N
Longitude 83.375539 ° W

Prepared for:

Livonia Public Schools
c/o Plante Moran Realpoint
3000 Town Center, Suite 100
Southfield, Michigan 48075

G2 Project No. 233929
February 16, 2024



February 16, 2024

Livonia Public Schools
c/o Mr. Collin Frink
Senior Consultant
Plante Moran Realpoint
3000 Town Center, Suite 100
Southfield, Michigan 48075

RE: Report of Geotechnical Pavement Investigation
Livonia Public Schools Central Office Pavement Improvements
15125 Farmington Road
City of Livonia, Wayne County, Michigan
G2 Project No. 233929

Dear Mr. Frink:

In accordance with your request, we have completed the pavement investigation associated with reconstruction of the existing pavements located at the Livonia Public Schools property located at the above address in Livonia, Michigan. This report presents the results of our observations and analyses and includes recommendations and construction considerations as they relate to the proposed site improvements.

We appreciate the opportunity to be of service to you and look forward to discussing our findings. In the meantime, if you have any questions regarding this report or any other matter pertaining to the project, please call us.

Sincerely,

G2 Consulting Group, LLC

Michael G. Dagher, P.E.
Project Engineer

Jason B. Stoops, P.E.
Associate / Project Manager

MGD/JBS/jbs

Enclosures



EXECUTIVE SUMMARY

We understand the proposed project includes improvements to the pavements associated with the Livonia Public Schools Central office. We understand the existing pavements appear to be reaching the end of their serviceable life and consideration is being given to performing a phased full-depth replacement. We do not know the phasing of the pavement improvements nor do we know the intended traffic counts for the proposed pavements; however, we understand some of the proposed pavements will service passenger vehicles and some of the pavements will service regular bus traffic.

The existing pavements appear to exhibit a range of distress including alligator cracking, edge cracking, block cracking, joint cracking, utility patching, and potholes. Based on our review of historical aerial imagery at the site available on Google Earth Pro, we observe that the pavement appears to have been resurfaced over several phases in the past. In general, the existing pavements appear to be approaching the end of their serviceable life.

The existing pavement at the evaluated locations consists of bituminous concrete (asphalt) ranging in thickness from 3 to 9 inches. Fill consisting of gravelly sand is present beneath the bituminous concrete extending to depths ranging from 3/4 to 1-1/2 feet below existing grade. We observed organic matter within the gravelly sand fill in soil borings P-02, P-07, and P-17. The gravelly sand fill in soil borings P-02, P-09, and P-17 is underlain by fill consisting of sand intermixed with topsoil extending to depths ranging from 2 to 3 feet below the existing site grades. The fill at each of the soil boring locations is underlain by native sand extending to the explored depths of 4 feet. No measurable groundwater was present either during or upon completion of the drilling operations.

The existing pavements generally appear to be approaching the end of their serviceable life with the pavement exhibiting a range of distresses and severity. The existing materials supporting the pavements appear to consist of gravelly sand; however, considering the range of thickness of the existing aggregate fill soils supporting the pavements, we do not anticipate the variability of this layer will be suitable to treat as an aggregate base layer. Considering the pavements generally support two types of traffic, passenger vehicles and school buses, we recommend two options for the proposed pavement reconstruction operations. Where the proposed pavements will primarily service passenger vehicles, we recommend the proposed pavement section consist of the Standard-Duty pavement section. Where the proposed pavements will primarily service school bus traffic, we recommend the proposed pavement section consist of the Heavy-Duty pavement section.

We recommend the Standary-Duty pavement section consist of 2 inches of MDOT 5EML supported by 2 inches of MDOT 3C underlain by 8 inches of MDOT 21AA crushed-limestone aggregate base. We recommend the proposed Heavy-Duty pavement section consist of 2 inches of MDOT 5EMH supported by 3 inches of MDOT 3C underlain by 10 inches of MDOT 21AA crushed-limestone aggregate base.

Do not consider this summary separate from the entire text of this report, with all the conclusions and qualifications mentioned herein. Details of our analysis and recommendations are discussed in the following sections and in the Appendix of this report.



PROJECT DESCRIPTION

We understand the proposed project includes improvements to the pavements associated with the Livonia Public Schools Central office. We understand the existing pavements appear to be reaching the end of their serviceable life and consideration is being given to performing a phased full-depth replacement. We do not know the phasing of the pavement improvements nor do we know the intended traffic counts for the proposed pavements; however, we understand some of the proposed pavements will service passenger vehicles and some of the pavements will service regular bus traffic.

The purpose of our investigation is to determine and evaluate the general pavement and subsurface conditions and to develop general recommendations for the pavement reconstruction operations.

SCOPE OF SERVICES

The field operations, laboratory testing, and engineering report preparation were performed under the direction and supervision of a licensed professional engineer. Our services were performed according to generally accepted standards and procedures in the practice of geotechnical engineering in this area. Our scope of services for this project consists of the following specific items:

1. We performed a visual evaluation of the existing pavement. We documented the types and relative magnitudes of the apparent pavement distresses.
2. We drilled a total of seventeen (17) soil borings, P-01 through P-17, extending to a depth of 5 feet each. We measured the thickness of existing pavement cross section materials and identified the type and condition of the subgrade soils.
3. We performed laboratory testing on samples obtained from the soil borings. Our laboratory testing program included visual engineering classification, moisture content, organic matter content, and unconfined compressive strength determinations.
4. We prepared this engineering report which includes our recommendations for pavement reconstruction and recommended pavement design cross sections.

FIELD OPERATIONS

Plante Moran Realpoint, in conjunction with NTH and G2 Consulting Group, LLC (G2), selected the number, depth, and location of the soil borings. We estimated the field locations of the soil borings by overlaying the scaled site plan on aerial imagery. In our overlaying process, we fit the scaled site plan to fixed reference points at the ground level and ultimately assigned latitude and longitude to the borings. We used a hand-held GPS device to field locate the latitude and longitude of the test locations. Current topographical plans depicting the ground surface elevation at the boring locations were not available for our review at the time of this proposal. If you would like more accurate positional information at the boring locations, we recommend the as-drilled locations be determined in the field using conventional surveying techniques.

The soil borings were drilled by 2G Drilling, Inc. using a truck-mounted rotary drilling rig. The driller used continuous flight 2-1/4 inch inside diameter hollow-stem augers to advance the soil borings to a depth of 5 feet. We obtained soil samples at depths of 2-1/2 and 4 feet by the Standard Penetration Test Method (ASTM D1586), which involves driving a 2-inch diameter split-spoon sampler into the soil with a 140-pound weight falling 30 inches. The sampler is generally driven three successive 6-inch increments, with the number of blows for each increment recorded. The number of blows required to advance the sampler the last 12 inches is termed the Standard Penetration Resistance (N). We present the blow counts for each six-inch increment and resulting N-values on the individual soil boring logs.

The soil samples were placed in sealed containers in the field and brought to our laboratory for testing and classification. The driller maintained a log of the encountered soil and groundwater conditions



during the drilling operations. The final soil boring logs are based on the field logs supplemented by our laboratory soil classification and testing results. Upon completion of the drilling operations, the driller backfilled the resulting excavations with on-site soils. The driller patches the pavements using asphalt patch.

LABORATORY TESTING

We subjected representative soil samples to laboratory testing to determine soil parameters pertinent to pavement design and site preparation. We classified the soil samples in general accordance with the G2 General Notes terminology. We performed laboratory testing on representative soil samples we obtained from the soil borings in accordance with the following tests:

- ASTM D2974 – Organic Matter Content (Loss-on-Ignition)
- ASTM D2488 – Visual-Manual Soil Classification (USCS)

We depict the results of the organic matter content tests on the soil boring logs at the depths we obtained from the soil samples. We will hold the soil samples for a period of 60 days following the issuance of this report after which we will discard the soil samples. If you would like to have the soil samples, please let us know.

EXISTING PAVEMENT AND SUBGRADE CONDITIONS

We documented the conditions of the existing pavements with photographs on Plates No. 2 through 9 in the Appendix. The existing pavements appear to exhibit a range of distress including alligator cracking, edge cracking, block cracking, joint cracking, utility patching, and potholes. Based on our review of historical aerial imagery at the site available on Google Earth Pro, we observe that the pavement appears to have been resurfaced over several phases in the past. The pavements appear to be sloped to drain collected water into catch basins located throughout the site. Portland cement collars are present surrounding the existing catch basins. We did not review the condition of the existing catch basins in our scope of work. In general, the existing pavements appear to be approaching the end of their serviceable life.

The existing pavement at the evaluated locations consists of bituminous concrete (asphalt) ranging in thickness from 3 to 9 inches. Fill consisting of gravelly sand is present beneath the bituminous concrete extending to depths ranging from 9 inches to 1-1/2 feet below existing grade. We observed organic matter within the gravelly sand fill in soil borings P-02, P-07, and P-17. The gravelly sand fill in soil borings P-02, P-09, and P-17 is underlain by fill consisting of sand intermixed with topsoil extending to depths ranging from 2 to 3 feet below the existing site grades. The fill at each of the soil boring locations is underlain by native sand extending to the explored depths of 4 feet.

The granular fill soils are generally very loose to medium compact having Standard Penetration Test (SPT) N-values ranging from 3 to 15 blows per foot (bpf) and organic matter contents ranging from 1 to 7 percent. The underlying native granular soils are very loose to medium compact having SPT N-values ranging from 3 to 25 blows per foot.

No measurable groundwater was present either during or upon completion of the drilling operations; however, fluctuations in perched and long-term groundwater levels should be anticipated due to seasonal variations and following periods of prolonged precipitation.

PAVEMENT EVALUATION AND RECOMMENDATIONS

General

The existing pavements generally appear to be approaching the end of their serviceable life with the pavement exhibiting a range of distresses. The existing materials supporting the pavements appear to

consist of gravelly sand; however, considering the range of thickness of the existing aggregate base materials supporting the pavements, we do not anticipate the variability of this layer will be suitable to re-use as an aggregate base layer. Considering the pavements generally support two types of traffic, passenger vehicles and school buses, we recommend two options for the proposed pavement reconstruction operations.

In general, we recommend the proposed pavements be constructed using either a standard-duty bituminous concrete pavement section or a heavy-duty bituminous concrete pavement section. Where the proposed pavements will primarily service passenger vehicles, we recommend the proposed pavement section consist of the standard-duty pavement section presented below. Where the proposed pavements will primarily service school bus traffic, we recommend the proposed pavement section consist of the heavy-duty pavement section presented below.

Pavement Reconstruction Recommendations

The existing pavements should be entirely removed to expose the underlying gravelly sand fill aggregate base. Consideration could be given to milling the existing pavements for the purpose of developing a stockpile of engineered fill. The exposed subgrade should then be cut to an elevation to accommodate the proposed aggregate base section. We anticipate the resulting subgrade will consist of predominantly granular soils with isolated areas of granular soils having elevated organic matter contents. The resulting subgrade should be thoroughly proof-compacted using a 15-ton vibratory roller set to the maximum amplitude. We recommend the proof-compaction operations consist of at least 10 passes in two perpendicular directions. Areas exhibiting elevated organic matter contents (e.g. more than 4 percent) should be undercut to expose non-organic soils. Soils exhibiting organic matter contents less than 4 percent may remain in place provided the materials pass the proof-compaction operations. In general, soils exhibiting unstable or otherwise unsuitable soil conditions for the support of pavements should be undercut to expose stable soils or improved with additional compaction.

We anticipate the existing subgrade conditions will require improvement in areas of severe pavement distress and in areas of organic soils. As such, we recommend the pavement contractor budget for improving the exposed subgrade soils with undercuts in these areas.

Subgrade undercuts, where required, should be visually evaluated by a qualified engineering technician to determine if subgrade stabilization will be required. We recommend undercut excavations be backfilled with either asphalt millings or MDOT 21AA dense-graded aggregate. All engineered fill should be placed and compacted at the approximate optimum moisture content as determined using the Modified Proctor Test (ASTM D1557) or in accordance with the Michigan Department of Transportation Density Testing and Inspection Manual (MTM). Where MTM methods are used for density control, we recommend the contractor target at least 98% of the maximum dry density as determined with MTM test methods. All engineered fill material should be placed and compacted at approximately the optimum moisture content. Frozen material should not be used as fill, nor should fill be placed on a frozen subgrade.

Pavement Design

We performed pavement design analyses in accordance with the "AASHTO Guide for Design of Pavement Structures". We anticipate the proposed subgrade soils will consist of the existing gravelly sand fill, the existing sand fill, or the native sand. Based on the existing subgrade soils, we have provided design pavement cross sections using an effective subgrade resilient modulus of 15,000 pounds per square in (psi).

We have analyzed the proposed pavement cross sections in accordance with the "1993 AASHTO Guide for Design of Pavement Structures". For the pavement design, we have assumed a serviceability loss of 2.0, a standard of deviation of 0.49, and a reliability of 0.90. The proposed pavement design cross sections are presented below:



Standard Duty Bituminous Concrete Pavement Section			
Material Type	Material Thickness (in)	Structural Coefficient	Structural Number
MDOT 5EML	2	0.42	0.84
MDOT 3C	2	0.42	0.84
MDOT 21AA Crushed Limestone	8	0.14	1.12
Total SN →			2.80

Heavy Duty Bituminous Concrete Pavement Section			
Material Type	Material Thickness (in)	Structural Coefficient	Structural Number
MDOT 5EMH	2	0.42	0.84
MDOT 3C	3	0.42	1.26
MDOT 21AA Crushed Limestone	10	0.14	1.40
Total SN →			3.50

Our analyses indicate the proposed Standard Duty Bituminous Concrete can service a total of approximately 1,300,000 equivalent single-axle loads (ESALs) over a 20-year design life. The Heavy Duty Bituminous Concrete can service a total of approximately 5,600,000 ESALs over a 20-year design life, corresponding to approximately 500 truck passes per day. If actual traffic volume information becomes available, G2 Consulting Group, LLC, should be notified so we can reevaluate our analyses of the proposed pavement section.

Large front-loading refuse trucks can impose significant concentrated wheel loads within trash dumpster pick-up areas. This type of loading can result in rutting of asphalt pavements and ultimately in failure. Therefore, we recommend MDOT Grade 3500HP non-reinforced concrete pavement at least 8 inches in thickness be used in these areas. The concrete pad should be large enough to support the entire refuse truck during pick-up operations.

All pavement materials are specified within the 2020 Standard Specifications for Construction from the Michigan Department of Transportation. The concrete pavement materials are described in Section 1004. The bituminous pavement materials are described in Section 501 and can be assigned a structural coefficient number of 0.42. The MDOT 21AA aggregate base course materials can be assigned a structural coefficient number of 0.14.

Pavement Drainage

We recommend edge drains be provided continuously along curbs since they can become a source of water infiltration into the pavement subgrade. Such drains should extend to minimum depths of 4 inches below the bottom of the proposed aggregate base course or granular fill placed within undercut areas. These drains could be connected to nearby catch basins. In addition, we recommend a minimum of 2 finger drains be installed at each catch basin location, extending a minimum of 15 feet from the catch basin. The pavement and subgrade should be properly sloped to promote effective surface and subsurface drainage and prevent water from ponding. We also recommend pavement subbase materials consist of non-frost-susceptible aggregates where possible.

Pavement Maintenance

We recommend that the joints within newly constructed pavements be sealed with hot rubber to prevent moisture intrusion into the subgrade soils below, as well as prevent spalling of the joint due to material entering the joint.

Regular timely maintenance should be performed on the pavement to reduce the potential deterioration



associated with moisture infiltration through surface cracks. The owner should be prepared to seal the cracks with a hot-applied elastic crack filler as soon as possible after cracking develops and as often as necessary to block the passage of water to the subgrade soils. In addition, regular joint maintenance should be performed.

GENERAL COMMENTS

We have formulated the evaluations and recommendations presented in this report relative to site preparation and pavement construction on the basis of data provided to us relating to the general location for the proposed pavement improvements. Any significant change in this data should be brought to our attention for review and evaluation with respect to the prevailing subsurface conditions.

The scope of the present investigation was limited to evaluation of subsurface conditions for the support of the pavements and other related aspects of the development. No chemical, environmental, or hydrogeological testing or analyses were included in the scope of this investigation. If changes occur in the design, location, or concept of the project, the conclusions and recommendations contained in this report are not valid unless G2 Consulting Group, LLC reviews the changes. G2 Consulting Group, LLC will then confirm the recommendations presented herein or make changes in writing.

We have based the analyses and recommendations submitted in this report upon the data from soil borings performed at the approximate locations shown on the Soil Boring Location Plans, Plate No. 1. This report does not reflect variations that may occur between the actual boring locations. The nature and extent of any such variations may not become clear until the time of construction. If significant variations then become evident, it may be necessary for us to re-evaluate our report recommendations.

Soil conditions at the site could vary from those generalized on the basis of soil borings made at specific locations. It is, therefore, recommended that G2 Consulting Group, LLC be retained to provide soil engineering services during the site preparation and pavement construction phases of the proposed project. This is to observe compliance with the design concepts, specifications, and recommendations. Also, this allows design changes to be made in the event that subsurface conditions differ from those anticipated prior to the start of construction.

APPENDIX

Soil Boring Location Plan

Plate No. 1

Soil Boring Logs

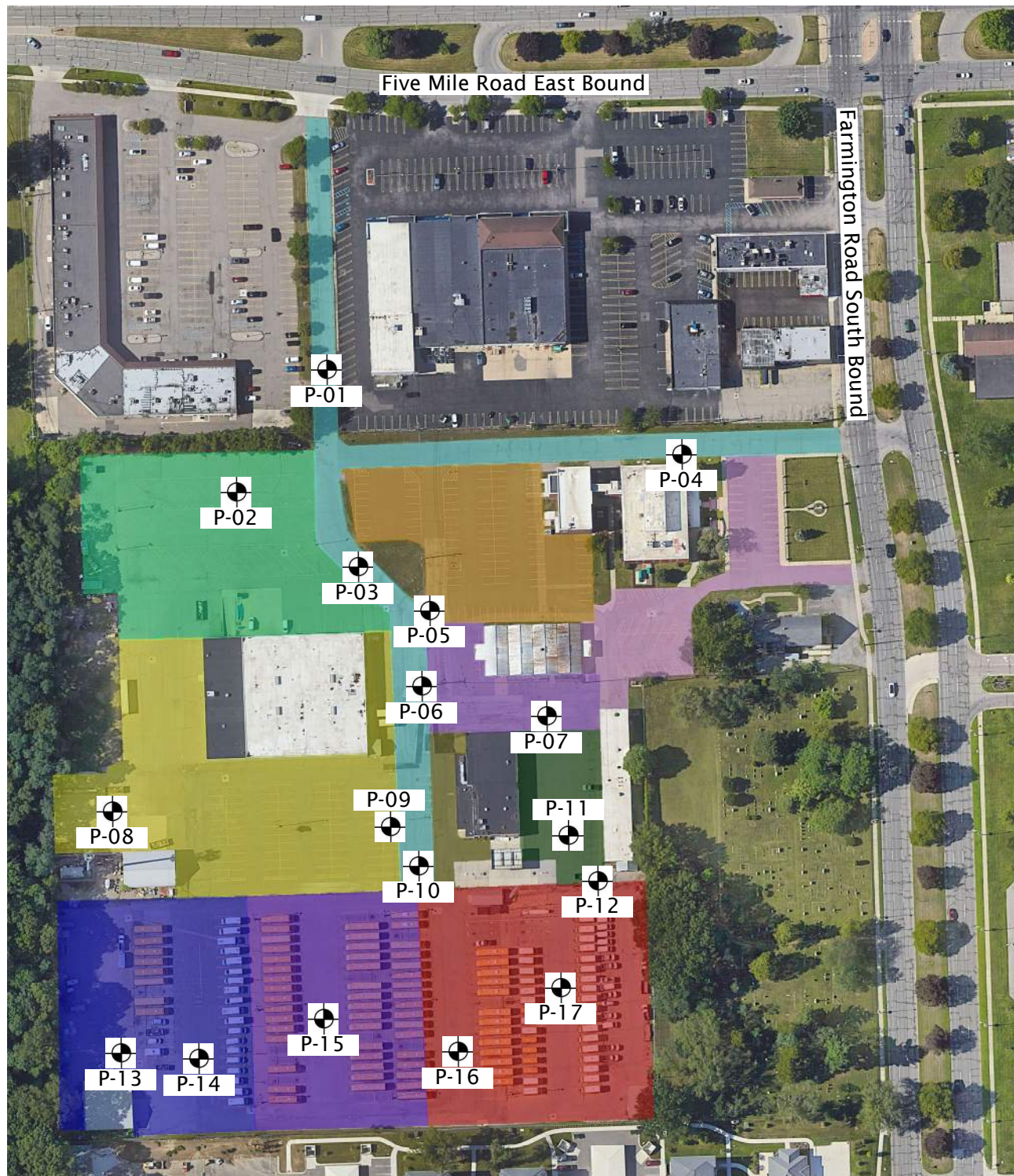
Figure No. 1 through 17

Photographic Documentation Log


Plate No. 2 through 9

General Notes Terminology

Figure No. 18



Legend

 Soil borings drilled by 2G Drilling between February 2 and February 7, 2024.



Soil Boring Location Plan

Livonia Public Schools Central Office
15125 Farmington Road
Livonia, Wayne County, Michigan



Project No. 233929

Drawn by: PJG

Date: 2/12/2024

Scale: NTS

Plate
No. 1

Excavation Backfilling Procedure:
Auger cuttings; asphalt patch

Project Name: Livonia Public School Central Office
Project Location: 15125 Farmington Road
City of Livonia, Wayne County, Michigan
G2 Project No. 233929
Latitude: 42.39567349° Longitude: -83.37640628°



Soil Boring No. P-02

SUBSURFACE PROFILE					SOIL SAMPLE DATA						
DEPTH (ft)	PRO- FILE	GROUND SURFACE ELEVATION: N/A			DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Bituminous Concrete (5 inches)									
		0.4									
		Fill: Brown Gravelly Sand (Organic Matter Content = 6.5%)									
		1.0									
		Fill: Medium Compact Dark Brown Sand with trace gravel; occasional glass fragments									
		(hydrocarbon odor)									
		3.0									
		Loose Brown Sand with trace gravel									
		4.0									
		End of Boring @ 4 ft									
5					5						

Total Depth: 4 ft
Drilling Date: February 2, 2024
Inspector: ---
Contractor: 2G Drilling, LLC
Driller: A. Guzdial

Drilling Method:
2-1/4 inch hollow-stem augurs

Water Level Observation:
Dry during and upon completion

Notes:
Borehole collapsed at 3-1/2 ft after auger removal

Excavation Backfilling Procedure:
Auger cuttings; asphalt patch

Soil Boring No. P-03

Soil Boring No. **2** CONSULTING GROUP

Latitude: 42.39542431° Longitude: -83.37586513°

[illegible]

Excavation Backfilling Procedure:
Auger cuttings; asphalt patch

Drilling Method:
2-1/4 inch hollow-stem augurs

Soil Boring No. P-05

Soil Boring No. **2** CONSULTING GROUP

Latitude: 42.39528152° Longitude: -83.37553859°

SOIL / PAVEMENT BORING 233929.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 2/16/24

Drilling Method:
2-1/4 inch hollow-stem augurs

Soil Boring No. P-06

Soil Boring No. **2** CONSULTING GROUP

Latitude: 42.39503004° Longitude: -83.3755791°

SUBSURFACE PROFILE				SOIL SAMPLE DATA							
DEPTH (ft)	PRO- FILE	GROUND SURFACE ELEVATION: N/A		DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)	
		Bituminous Concrete (9 inches)									
		0.8									
		Fill: Brown Gravelly Sand									
		1.0									
		Loose to Medium Compact Brown Sand with trace clay and gravel									

Total Depth: 4 ft
Drilling Date: February 2, 2024
Inspector: ---
Contractor: 2G Drilling, LLC
Driller: A. Guzdial

Water Level Observation:
Dry during and upon completion

Excavation Backfilling Procedure:
Auger cuttings; asphalt patch


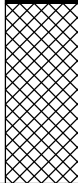
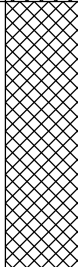
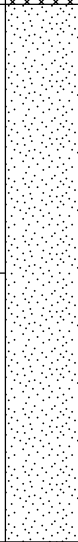
Drilling Method:
2-1/4 inch hollow-stem augurs

SOIL / PAVEMENT BORING 233929.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 2/16/24

Soil Boring No. P-09

Soil Boring No. **2** CONSULTING GROUP

Latitude: 42.39457438° Longitude: -83.37571479°

SUBSURFACE PROFILE				SOIL SAMPLE DATA						
DEPTH (ft)	PRO- FILE	GROUND SURFACE ELEVATION: N/A		DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Bituminous Concrete (4 inches) <div>0.3</div>								
		Fill: Brown Gravelly Sand <div>1.0</div>								
		Fill: Very Loose Brown Sand with trace gravel; intermixed topsoil <div>2.0</div>			S-1	3 2 1	3			
		Loose Brown Sand with trace silt <div>4.0</div>			S-2	4 4 5	9			
		End of Boring @ 4 ft								
5				5						

Total Depth: 4 ft
Drilling Date: February 7, 2024
Inspector: ---
Contractor: 2G Drilling, LLC
Driller: A. Guzdial

Drilling Method:
2-1/4 inch hollow-stem augurs

Water Level Observation:
Dry during and upon completion

Notes:
Borehole collapsed at 3-1/2 ft after auger removal

Excavation Backfilling Procedure:
Auger cuttings; asphalt patch

Drilling Method:
2-1/4 inch hollow-stem augurs

Excavation Backfilling Procedure:
Auger cuttings; asphalt patch

Project Name: Livonia Public School Central Office

Project Location: 15125 Farmington Road
City of Livonia, Wayne County, Michigan

G2 Project No. 233929

Latitude: 42.39439316° Longitude: -83.37479636°



Soil Boring No. P-12

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO- FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Bituminous Concrete (3 inches)	0.3						
		Fill: Brown Gravelly Sand	0.9						
				S-1	5 5 5	10			
		Loose Brown Sand with trace silt							
				S-2	3 3 2	5			
		End of Boring @ 4 ft	4.0						
5			5						

Total Depth: 4 ft
 Drilling Date: February 7, 2024
 Inspector: ---
 Contractor: 2G Drilling, LLC
 Driller: A. Guzdial

Water Level Observation:
 Dry during and upon completion

Excavation Backfilling Procedure:
 Auger cuttings; asphalt patch

Drilling Method:
 2-1/4 inch hollow-stem augurs

Soil Boring No. P-13

Soil Boring No.  **CONSULTING GROUP**

Latitude: 42.39382847° Longitude: -83.37691666°

SUBSURFACE PROFILE					SOIL SAMPLE DATA						
DEPTH (ft)	PRO- FILE	GROUND SURFACE ELEVATION: N/A			DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
	<div>Bituminous Concrete (4 inches) 0.3 Fill: Brown Gravelly Sand 1.5 Medium Compact Brown Sand with trace silt 4.0 End of Boring @ 4 ft</div>										
						S-1	7 9 10	19			
						S-2	7 9 8	17			
5											

Water Level Observation:
Dry during and upon completion

Notes:
Borehole collapsed at 3 ft after auger removal

Excavation Backfilling Procedure:
Auger cuttings; asphalt patch

Drilling Method:
2-1/4 inch hollow-stem augurs

SOIL / PAVEMENT BORING 233929.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 2/16/24

Excavation Backfilling Procedure:
Auger cuttings; asphalt patch

Excavation Backfilling Procedure:
Auger cuttings; asphalt patch

Soil Boring No. P-17

Soil Boring No. **2** CONSULTING GROUP

Latitude: 42.39404506° Longitude: -83.37495747°

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO- FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Bituminous Concrete (3 inches)	0.3						
		Fill: Brown Gravelly Sand (Organic Matter Content = 5.8%)	1.0						
		Fill: Medium Compact Brown to Dark Brown Sand with trace gravel; intermixed topsoil	3.0	S-1	7 7 8	15			
		Loose Brown Sand	4.0	S-2	4 4 4	8			
		End of Boring @ 4 ft							

Excavation Backfilling Procedure:
Auger cuttings; asphalt patch

Drilling Method:
2-1/4 inch hollow-stem augurs



1 Alligator Cracking

NTS



--- Livonia Central Office - Plan View

NTS



2 Alligator Cracking Surrounding Manhole

NTS



3 Edge Cracking - Potholes - Alligator Cracking

NTS



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ANN ARBOR, MICHIGAN 48108
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F: 734.390.9331

PROJECT NO.: 233929

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PROJECT NAME
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Documentation Log

PLATE NUMBER

02



1 Severe Alligator Cracking - Potholes NTS



--- Livonia Central Office - Plan View NTS



2 Joint Cracking - Alligator Cracking NTS



3 Negligible to Low-Severity Block Cracking NTS



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03



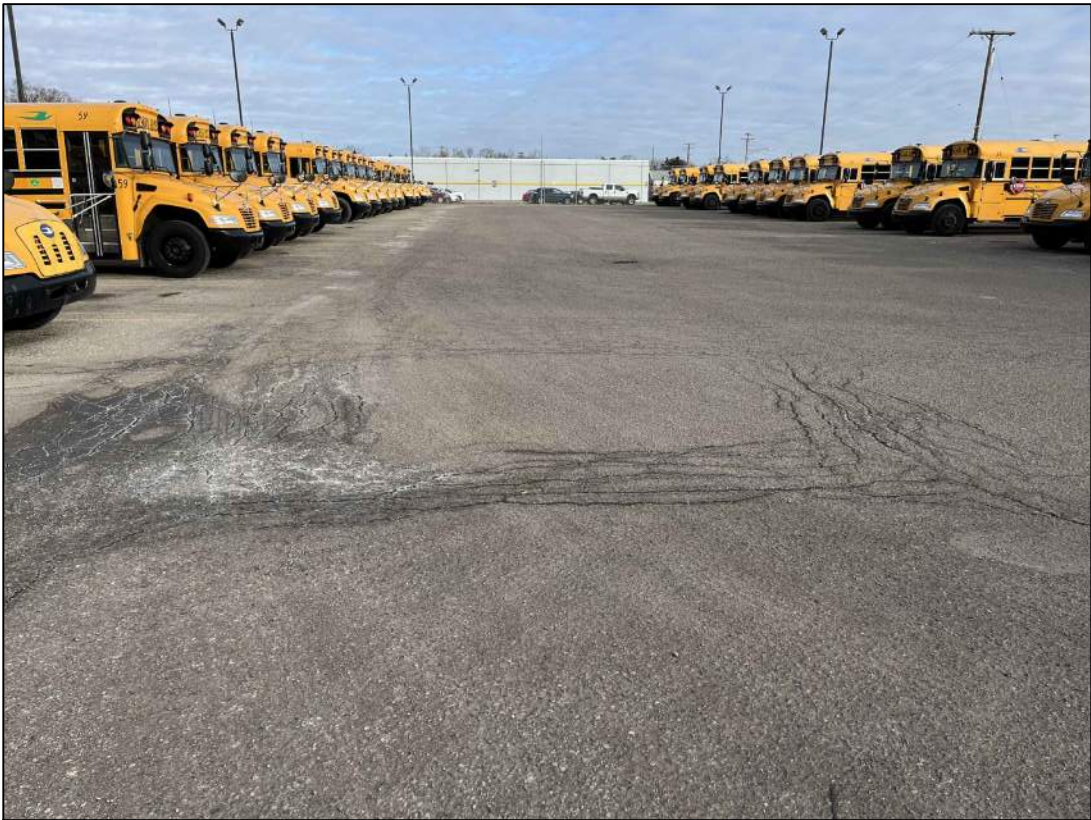
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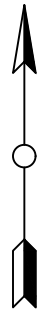
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2 Alligator Cracking NTS



3 Block Cracking - Alligator Cracking NTS



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PLATE NUMBER

04



1 Alligator Cracking NTS



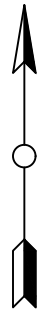
--- Livonia Central Office - Plan View NTS



2 Block Cracking NTS



3 Alligator Cracking NTS



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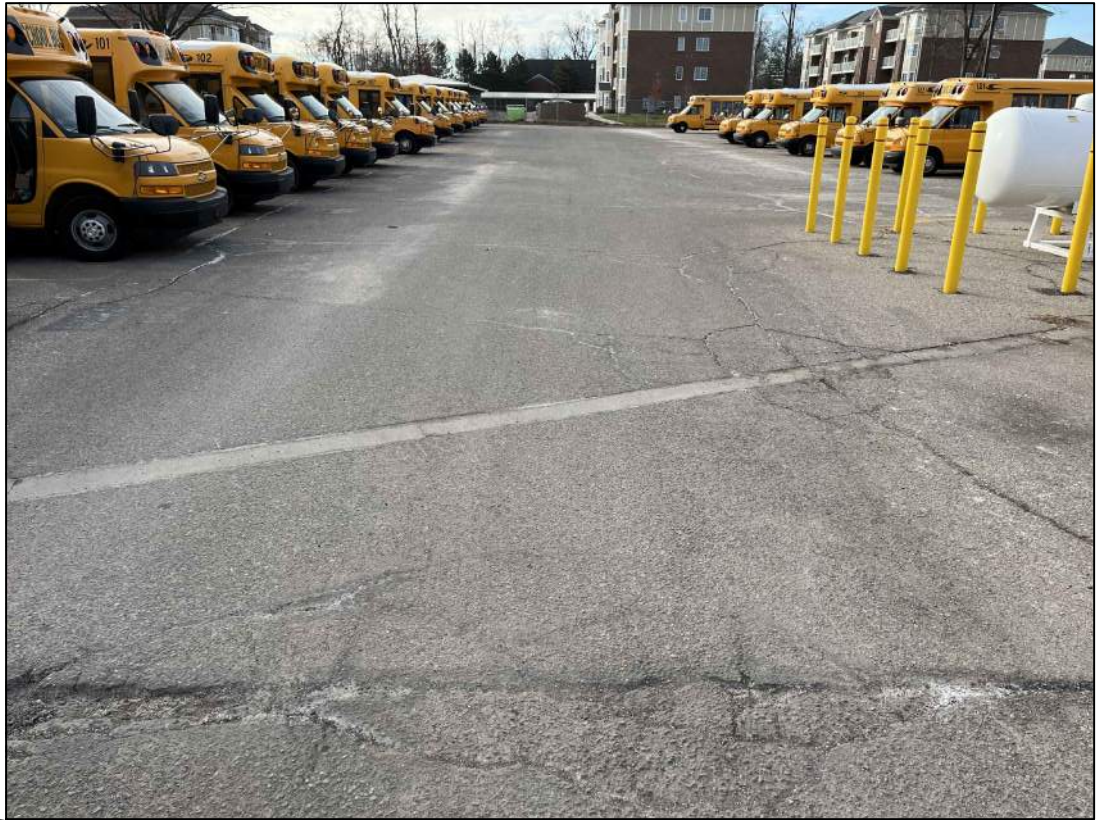
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PLATE NUMBER
05



1

Utility Patching - Pothole

NTS



Livonia Central Office - Plan View

NTS



2

Block Cracking - Potholes

NTS



3

Block Cracking - Alligator Cracking - Potholes

NTS



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PROJECT NO.: 233929

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06



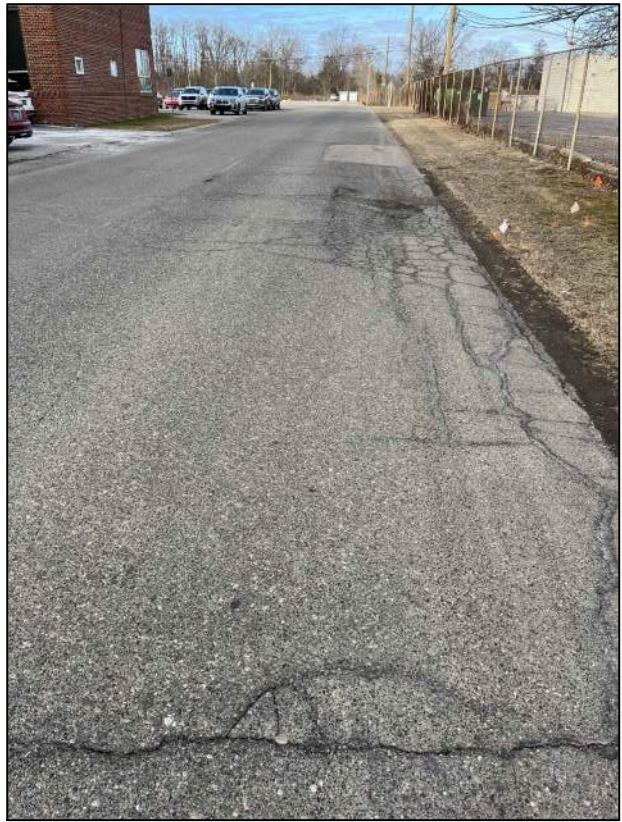
1 Block Cracking - Alligator Cracking NTS



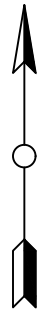
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2 Block Cracking - Alligator Cracking NTS



3 Edge Cracking - Alligator Cracking NTS



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LOCATION
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Livonia, Michigan 48154

SHEET TITLE
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PLATE NUMBER
07



1 Block Cracking - Salt Buildup NTS



--- Livonia Central Office - Plan View NTS



2 Transverse or Joint Cracking NTS



3 Alligator Cracking - Salt Buildup NTS



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F: 734.390.9331

PROJECT NO.: 233929

DATE: 2/14/2024

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PROJECT NAME
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Central Office

LOCATION
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Livonia, Michigan 48154

SHEET TITLE
Photographic
Documentation Log

PLATE NUMBER
08



1

Block Cracking - Alligator Cracking

NTS



Livonia Central Office - Plan View

NTS



2

Block Cracking - Alligator Cracking

NTS



3

Block Cracking - Alligator Cracking - Potholes

NTS



CONSULTING
GROUP

1350 EISENHOWER PLACE
ANN ARBOR, MICHIGAN 48108
O: 734.390.9330
F: 734.390.9331

PROJECT NO.: 233929

DATE: 2/14/2024

DRAWN BY: MGD, PE

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Central Office

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Livonia, Michigan 48154

SHEET TITLE
Photographic
Documentation Log

PLATE NUMBER

09

GENERAL NOTES TERMINOLOGY

Unless otherwise noted, all terms herein refer to the Standard Definitions presented in ASTM 653.

PARTICLE SIZE

Boulders	- greater than 12 inches
Cobbles	- 3 inches to 12 inches
Gravel - Coarse	- 3/4 inches to 3 inches
- Fine	- No. 4 to 3/4 inches
Sand - Coarse	- No. 10 to No. 4
- Medium	- No. 40 to No. 10
- Fine	- No. 200 to No. 40
Silt	- 0.005mm to 0.074mm
Clay	- Less than 0.005mm

CLASSIFICATION

The major soil constituent is the principal noun, i.e. clay, silt, sand, gravel. The second major soil constituent and other minor constituents are reported as follows:

Second Major Constituent (percent by weight)	Minor Constituent (percent by weight)
Trace - 1 to 12%	Trace - 1 to 12%
Adjective - 12 to 35%	Little - 12 to 23%
And - over 35%	Some - 23 to 33%

COHESIVE SOILS

If clay content is sufficient so that clay dominates soil properties, clay becomes the principal noun with the other major soil constituent as modifier, i.e. sandy clay. Other minor soil constituents may be included in accordance with the classification breakdown for cohesionless soils, i.e. silty clay, trace sand, little gravel.

Consistency	Unconfined Compressive Strength (psf)	Approximate Range of (N)
Very Soft	Below 500	0 - 2
Soft	500 - 1,000	3 - 4
Medium	1,000 - 2,000	5 - 8
Stiff	2,000 - 4,000	9 - 15
Very Stiff	4,000 - 8,000	16 - 30
Hard	8,000 - 16,000	31 - 50
Very Hard	Over 16,000	Over 50

Consistency of cohesive soils is based upon an evaluation of the observed resistance to deformation under load and not upon the Standard Penetration Resistance (N).

COHESIONLESS SOILS

Density Classification	Relative Density %	Approximate Range of (N)
Very Loose	0 - 15	0 - 4
Loose	16 - 35	5 - 10
Medium Compact	36 - 65	11 - 30
Compact	66 - 85	31 - 50
Very Compact	86 - 100	Over 50

Relative Density of cohesionless soils is based upon the evaluation of the Standard Penetration Resistance (N), modified as required for depth effects, sampling effects, etc.

SAMPLE DESIGNATIONS

AS -	Auger Sample - Cuttings directly from auger flight
BS -	Bottle or Bag Samples
S -	Split Spoon Sample - ASTM D 1586
LS -	Liner Sample with liner insert 3 inches in length
ST -	Shelby Tube sample - 3 inch diameter unless otherwise noted
PS -	Piston Sample - 3 inch diameter unless otherwise noted
RC -	Rock Core - NX core unless otherwise noted

STANDARD PENETRATION TEST (ASTM D 1586) - A 2.0 inch outside-diameter, 1-3/8 inch inside-diameter split barrel sampler is driven into undisturbed soil by means of a 140-pound weight falling freely through a vertical distance of 30 inches. The sampler is normally driven three successive 6-inch increments. The total number of blows required for the final 12 inches of penetration is the Standard Penetration Resistance (N).



APPENDIX B

- **Report on Underground Utilities**



Report on Geotechnical Pavement
Investigation

**Proposed Franklin High
School Pavement
Improvements
31000 Joy Road
Livonia, Michigan 48150**

Latitude 42.356315 ° N
Longitude 83.346954 ° W

Prepared for:

Livonia Public Schools
15125 Farmington Road
Livonia, Michigan 48154

G2 Project No. 243784
December 19, 2024



December 19, 2024

Mr. Phillip Francis
Livonia Public Schools
15125 Farmington Road
Livonia, Michigan 48154

Re: Report on Geotechnical Pavement Investigation
Proposed Franklin High School Pavement Improvements
31000 Joy Road
Livonia, Michigan 48150
G2 Project No. 243784

Dear Mr. Francis:

We have completed the geotechnical pavement investigation for the proposed improvements within the existing main parking lot on the Franklin High School campus located at 31000 Joy Road in Livonia, Michigan. This report presents the results of our observations, analyses, and recommendations related to earthwork, subgrade preparation, and bituminous pavement design/construction.

We appreciate the opportunity to be of service to you and look forward to discussing the recommendations presented herein. In the meantime, if you have any questions regarding the report or any other matter pertaining to the project, please call us.

Sincerely,

G2 Consulting Group, LLC

Tyler S. Hesse, P.E.
Project Engineer

Jason B. Stoops, P.E.
Associate / Project Manager

TSH/JBS/JMH/ljv

Enclosures

EXECUTIVE SUMMARY

We understand the project consists of rehabilitating existing bituminous pavements within the existing main parking lot at the Franklin High School campus located at 31000 Joy Road in Livonia, Michigan. We understand the existing parking lot on the west side of the high school building will be reconstructed to full depth.

Approximately 3-3/4 to 4-1/4 inches of bituminous pavement is present at the pavement-core/hand-auger boring locations. The bituminous pavements are supported by approximately 4-3/4 to 10-3/4 inches of crushed bituminous concrete at borings B-01 through B-04. Approximately 3 to 5 inches of crushed concrete sand and gravel with little silt aggregate base soils underlie the crushed bituminous concrete within borings B-01 through B-03. A grain size analysis was performed on a sample of the crushed concrete aggregate base obtained from borings B-01 and B-03. Test results indicate the crushed concrete aggregate base does not meet the gradation requirements of MDOT 21AA dense graded aggregate base due to an excessive amount of material passing the No. 200 sieve (clay and silt).

Cohesive fill soils consisting of medium to very stiff silty clay and sandy clay underlie the pavement section within borings B-01 and B-03 and extends to approximate depth of 2 feet within boring B-01 and the explored depth of 5 feet within boring B-03. Native medium to very stiff silty clay underlies the fill soils within boring B-01 and pavement section within borings B-02 and B-04 and extends to the explored depth of 5 feet below existing grade. Groundwater was encountered at depths ranging from 1-1/4 to 4 feet below existing grade within borings B-01 through B-04. Upon completion of drilling operations, groundwater was measured at a depth of 5 feet within the boring locations.

Cohesive fill soils, with organic matter contents ranging from 1.5 to 2.4 percent, were encountered within borings B-01 and B-03 and extend to approximate depths ranging from 2 to 5 feet below existing grade. The fill soils do not appear to have been placed in an engineered manner and are marginally suitable for pavement support provided passing a proof-roll evaluation.

Based on conducted laboratory testing, the surficial cohesive soils throughout the proposed pavement reconstruction areas have relatively high moisture contents and are likely approaching or have exceeded their respective plastic limits. Therefore, these soils may become unstable under repeated loading from construction equipment. If unstable soils are encountered, we recommend limiting undercuts to a depth of 12-inches below proposed aggregate base, compacting the exposed subgrade, and backfilling with MDOT 21AA dense-graded aggregate. If a stable subgrade cannot be achieved at a maximum depth of 12-inches below the proposed subgrade, we recommend placing a geogrid reinforcement, such as TENSAR Tri-Ax geogrid (Type III) or equivalent, at a depth of 12-inches below proposed subgrade and backfilling with MDOT 21AA aggregate. The geogrid should extend to a minimum of 5-feet beyond the edges of the unstable area. Any undercut areas within predominantly clayey soils should be connected with finger drains to the closest catch basins to drain water from within the granular undercut backfill material.

Based on the results of our analyses, we recommend a minimum standard-duty bituminous pavement section consisting of 2-inches of MDOT 5EML bituminous concrete wearing course and 2-inches of MDOT 4EML bituminous concrete leveling course supported on a minimum of 8-inches of MDOT 21AA dense-graded aggregate base material. We understand that ultimately the proposed pavement section will match that of the adjacent bituminous pavements; however, we recommend that the above minimum pavement section be used.

Do not consider this summary separate from the entire text of this report, with all the conclusions and qualifications mentioned herein. Details of our analysis and recommendations are discussed in the following sections and in the Appendix of this report.



PROJECT DESCRIPTION

We understand the project consists of rehabilitating existing bituminous pavements within the existing main parking lot at the Franklin High School campus located at 31000 Joy Road in Livonia, Michigan. We understand the existing parking lot on the west side of the high school building will be reconstructed to full depth.

A final grade plan of parking lot was not available upon completion of this report. However, we assume final grades will be near or at existing grades. No information regarding traffic counts within the parking lot were available upon completion of this report. However, we assume the parking lot services primarily car traffic with the occasional garbage and delivery truck and school bus. It is our understanding the bus drop off loop is on the east side of the school.

If information related to existing and final site grades, or existing traffic frequencies becomes available or changes, G2 Consulting Group, LLC (G2) should be notified to re-evaluate the recommendations provided herein. The purpose of our exploration is to determine and evaluate the general subsurface conditions at the site and to develop recommendations related to earthwork, subgrade preparation, and bituminous pavement design/construction as they relate to the geotechnical conditions on site.

SCOPE OF SERVICES

The field operations, laboratory testing, and engineering report preparation were performed under direction and supervision of a licensed professional engineer. Our services were performed according to generally accepted standards and procedures in the practice of geotechnical engineering in this area. Our scope of services for this project is as follows:

1. We performed a total of four (4) pavement-core/hand-auger borings, B-01 through B-04, within the proposed pavement reconstruction areas extending to a depth of 5 feet each.
2. We performed laboratory testing on representative samples obtained from the soil borings. Laboratory testing included visual engineering classification, natural moisture content, organic matter content, grain-size distribution, Atterberg limits, and unconfined compressive strength determinations.
3. We prepared this engineering report. The report includes recommendations regarding earthwork, subgrade preparation, and bituminous pavement design/construction.

FIELD OPERATIONS

Plante Moran Realpoint, in conjunction with G2, selected the number, depth, and location of the pavement-core/hand-auger borings. The boring locations were determined in the field using GPS assisted mobile technology and by measuring from known surface features using conventional taping methods. The approximate boring location are shown on the Pavement-Core Location Plan, Plate No. 1. Existing pavement surface elevations at the boring locations were estimated using the spot elevations and elevation contours on the provided drawing titled "Partial Topographical survey," prepared by KEM-Tech, Sheet No. 1, dated 12/5/2024. If more accurate elevation information is required, we recommend the existing surface elevations at the pavement-core locations be determined using conventional surveying techniques.

The pavement cores were performed using a 4-inch diameter diamond-tipped core barrel. Hand-auger borings were performed within each pavement core using a 3-inch diameter hand-auger. Soil samples were obtained at 2-1/2 foot and 5-foot depths. The soil samples were placed in sealed containers in the field and brought to the laboratory for testing and classification. A Dynamic Cone Penetrometer (DCP) test was performed within each hand auger boring at a depth of 2-1/2 feet and 5 feet, to evaluate the consistency of the in-situ soil. DCP testing involves driving a 1-1/2-inch diameter cone with a 45° vertex angle into the ground using a 15-pound weight dropped 20-inches after the cone is seated into the



bottom of the hand auger borehole. The Dynamic Cone Penetrometer is driven 1-3/4-inches. The blow count for the 1-3/4-inch drives are presented on the individual hand-auger soil boring logs. The reported blow count is assumed to be equivalent to the Standard Penetration Test N-value.

The soil samples were placed in sealed containers and brought to our laboratory for testing and classification. During field operations, a G2 staff engineer maintained logs of the subsurface conditions, including changes in stratigraphy and observed groundwater levels. The final boring logs are based on the field boring logs supplemented by laboratory soil classification and test results. The boreholes were backfilled with auger cuttings and topped with cold-patch asphalt upon completion of drilling operations.

LABORATORY TESTING

Representative soil samples were subjected to laboratory testing to determine soil parameters pertinent to site preparation and pavement design. An experienced geotechnical engineer classified the samples in general conformance with the Unified Soil Classification System (USCS). Laboratory testing was conducted in conformance with the following ASTM Test Methods:

- “Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass” (ASTM D2216);
- “Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils (ASTM D2974);
- “Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates” (ASTM C136); and
- “Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils” (ASTM D4318).

The unconfined compressive strengths were determined using a spring-loaded hand penetrometer. The hand penetrometer estimates the unconfined compressive strength to a maximum of 4-1/2 tons per square foot (tsf) by measuring the resistance of the soil sample to the penetration of a spring-loaded cylinder.

The results of the moisture contents, organic matter contents, and unconfined compressive strengths are indicated on the Pavement-Core/Hand-Auger Boring Logs, Figure Nos. 1 through 4, at the depths the samples were obtained. The results of the grain size distributions determined in accordance with ASTM Test Method C136 and the Atterberg limits determined in accordance with ASTM D4318 are presented graphically in the appendix as Figure Nos. 5 and 6, respectively.

We will hold the soil samples for 60 days from the date of this report, after which time they will be discarded. If you would like the samples, please let us know.

SITE DESCRIPTION

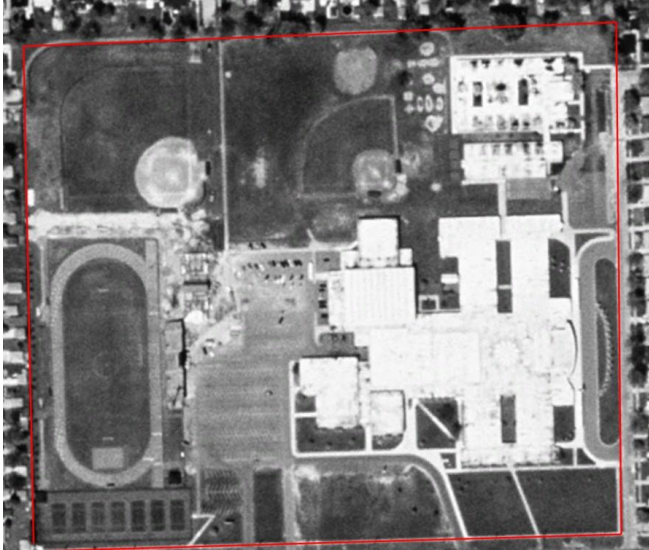
The existing Franklin High School campus is located at 31000 Joy Road in Livonia, Michigan. The campus is bounded by Hillcrest Street to the east, by Joy Road to the south, and by a residential development to the north and west.

The campus currently consists of a single to two-story, slab-on-grade school building with associated bituminous and Portland cement concrete (PCC) pavements, seven (7) tennis courts, a football field with associated running track and bleachers, and two (2) baseball diamonds. The remainder of the campus is grass covered.

We performed a visual evaluation of the existing bituminous pavements within the proposed reconstruction area. During our evaluation, pavement distresses consisting of medium to high-severity fatigue (alligator), low to medium-severity transverse, and low-severity longitudinal and joint cracking were observed. The observed pavement distresses are shown in the Photographic Log, Figure Nos. 8 through 11, in the appendix. The pavements are sloped to drain into catch basins generally located on

the east side of the parking lot. Portland cement concrete collars are present around most of the catch basins. The catch basins generally consist of brick and mortar construction atop of pre-cast structures.

Based on historical aerial imagery, the campus was originally constructed sometime prior to 2000. Furthermore, it appears the bituminous pavements located west of the school building were rehabilitated sometime around 2017.



Historical Aerial Imagery (2000)



Historical Aerial Imagery (2017)



Aerial Imagery (2024)

Based on the provided drawing titled "Partial Topographical survey," prepared by KEM-Tech, Sheet No. 1, dated 12/5/2024, existing grades within the proposed pavement reconstruction areas range from elevation 932-1/2 to 637-1/4 feet. Furthermore, existing grades appear to slope downward from east to west.

EXISTING PAVEMENT AND SUBSURFACE CONDITIONS

Approximately 3-3/4 to 4-1/4 inches of bituminous pavement is present at the pavement-core/hand-auger boring locations. The bituminous pavements are supported by approximately 4-3/4 to 10-3/4 inches of crushed bituminous concrete at borings B-01 through B-04. Approximately 3 to 5 inches of crushed concrete sand and gravel with little silt aggregate base soils underlie the crushed bituminous concrete within borings B-01 through B-03. A grain size analysis was performed on a sample of the crushed concrete aggregate base obtained from borings B-01 and B-03. Test results indicate the crushed concrete aggregate base does not meet the gradation requirements of MDOT 21AA dense graded aggregate base due to an excessive amount of material passing the No. 200 sieve (clay and silt).

Cohesive fill soils consisting of silty clay and sandy clay underlie the pavement section within borings B-01 and B-03 and extends to approximate depth of 2 feet within boring B-01 and the explored depth of 5 feet within boring B-03. Native silty clay underlies the fill soils within boring B-01 and pavement section within borings B-02 and B-04 and extends to the explored depth of 5 feet below existing grade.

The cohesive fill soils are medium to very stiff in consistency, with moisture contents ranging from 19 to 25 percent, organic matter contents ranging from 1.5 to 2.4 percent, and unconfined compressive strengths ranging from 1,000 to 6,000 pounds per square foot (psf). The native cohesive soils are medium to very stiff in consistency, with natural moisture contents ranging from 21 to 27 percent, a liquid and plastic limit of 41 and 20, respectively, and unconfined compressive strengths ranging from 1,000 to 6,000 psf.

The stratification depths shown on the boring logs represent the soil conditions at the specified locations. Variations may occur between and away from the boring locations. Additionally, the stratigraphic lines represent the approximate boundaries between soil types. The transition may be more gradual than indicated. We have prepared the soil boring logs on the basis of the field logs of the soil conditions encountered supplemented by laboratory classification and testing.

The Pavement-Core/Hand-Auger Boring Location Plan, Plate No. 1, and Pavement-Core/Hand-Auger Boring Logs, Figure Nos. 1 through 4, are presented in the Appendix. The soil profiles described above are generalized descriptions of the conditions encountered at the boring locations. General Notes Terminology defining the nomenclature used on the soil boring logs and elsewhere in this report are presented on Figure No. 7.

GROUNDWATER CONDITIONS

Groundwater observations were made during and upon completion of drilling operations. Groundwater was encountered at depths ranging from 1-1/4 to 4 feet below existing grade within borings B-01 through B-04. Upon completion of drilling operations, groundwater was measured at a depth of 5 feet within the boring locations.

Fluctuations in perched and long-term groundwater levels should be anticipated due to seasonal variations and following periods of prolonged precipitation. It should also be noted that groundwater observations made during drilling operations in predominantly cohesive soils are not necessarily indicative of the static groundwater level. This is due to the low permeability of such soils and the tendency of drilling operations to seal off the natural paths of groundwater flow.

PAVEMENT RECOMMENDATIONS

General

We understand the existing bituminous pavements will be completely reconstruction. This will involve complete removal of the existing bituminous pavements and supporting aggregate base soils, proof rolling the exposed subgrade, performing any necessary undercuts, and constructing a new pavement section.

Subgrade Preparation

Based on the provided drawing titled "Partial Topographical survey," prepared by KEM-Tech, Sheet No. 1, dated 12/5/2024, existing grades within the proposed pavement reconstruction areas range from elevation 932-1/2 to 637-1/4 feet. A grading plan detailing finished pavement grades was unavailable at the time of this report; however, it is assumed that grades will not be raised.

We anticipate earthwork will consist demolition of the existing pavements and removal of the underlying aggregate base soils, proof-rolling the exposed subgrade, and preparing the subgrade for pavement support. We recommend all earthwork operations be performed in accordance with comprehensive specifications and be properly monitored in the field by qualified personnel under the direction of a licensed professional engineer.

Following demolition of the existing pavements and removal of the aggregate base soils, the exposed subgrade is expected to consist of cohesive fill soils and/or native silty clay. Where cohesive soils are encountered, soils should be proof-rolled with a fully loaded tandem-axle dump truck and be evaluated for stability. Unsuitable soils exhibiting excessive instability, such as severe rutting, should be improved with additional compaction or undercut to expose stable soils.

Cohesive fill soils, with organic matter contents ranging from 1.5 to 2.4 percent, were encountered within borings B-01 and B-03 and extend to approximate depths ranging from 2 to 5 feet below existing grade. The fill soils do not appear to have been placed in an engineered manner and are marginally suitable for pavement support provided passing a proof-roll evaluation.

Based on conducted laboratory testing, the surficial cohesive soils throughout the proposed pavement reconstruction areas have relatively high moisture contents and are likely approaching or have exceeded their respective plastic limits. Therefore, these soils may become unstable under repeated loading from construction equipment. The subgrade should not be exposed to prolonged periods of precipitation to prevent the subgrade from becoming unstable. We recommend earthwork operations be performed during the predominantly drier summer months.

Engineered fill should be free of organic matter, frozen soil, clods, or other harmful material. The fill should be placed in uniform horizontal layers that are not more than 9 inches in loose thickness. The engineered fill should be compacted to achieve a density of at least 95 percent of the maximum dry density as determined by the Modified Proctor compaction test (ASTM D 1557). All engineered fill material should be placed and compacted at approximately the optimum moisture content. Frozen material should not be used as fill, nor should fill be placed on a frozen subgrade. In order to economically conduct earthwork operations at the site, imported fill, adhering to the aforementioned requirements, should consist of low plasticity clays or well-graded aggregates. Low plasticity clays, having a plasticity index less than 20 percent, should be placed within +3 or -1 percent of the optimum moisture content as determined by the Modified Proctor Test (ASTM D1557). For well-graded aggregates, such as MDOT Class II Sand, we recommend the engineered fill be placed at ± 2 percent of the optimum moisture content as determined by ASTM D1557.

Pavement Design

Provided the recommendations provided within the *Subgrade Preparation Recommendations* section of this report are adhered to, we recommend a subgrade resilient modulus (MR) of 6,000 pounds per square inch (psi) be used for the anticipated subgrade soils.

Information related to existing traffic frequencies was unavailable at the time of this report. It is assumed that traffic will primarily consist of passenger-car vehicles (PCVs) with occasional school buses, delivery, waste management, and emergency response vehicles. If information related to existing/anticipated traffic frequencies becomes available, G2 should be notified to re-evaluate the recommendations provided herein.



Given the anticipated traffic frequencies, we have designed a standard-duty pavement section. The standard-duty pavement section is based on an estimated 50,000 equivalent single axle loads (ESALs) over a 20-year design life. For evaluation purposes, we estimated a serviceability loss of 2.0, a standard deviation of 0.49, and a reliability of 95 percent.

Based on the results of our analyses, we recommend a minimum standard-duty bituminous pavement section consisting of 2-inches of MDOT 5EML bituminous concrete wearing course and 2-inches of MDOT 4EML bituminous concrete leveling course supported on a minimum of 8-inches of MDOT 21AA dense-graded aggregate base material. We understand that ultimately the proposed pavement section will match that of the adjacent bituminous pavements; however, we recommend that the above minimum pavement section be used.

Typical Standard-Duty Asphalt Flexible Pavement Section		
Material	Thickness	Structural Coefficient
MDOT 5EML Bituminous Wearing Course	2-inches	0.42
MDOT 4EML Bituminous Leveling Course	2-inches	0.42
MDOT 21AA Aggregate Base Course (dense-graded)	8-inches	0.14
		Total SN = 2.80

All pavement materials are specified within the 2020 Standard Specifications for Construction from the Michigan Department of Transportation (MDOT). The bituminous pavement materials are described in Section 501 and can be assigned a structural coefficient number of 0.42. Any new imported aggregate base course material can be assigned a structural coefficient number of 0.14.

We anticipate some subgrade instability will be encountered throughout the pavement areas depending on the time of year of construction. We recommend limiting undercuts to a depth of 12-inches below proposed aggregate base, compacting the exposed subgrade, and backfilling with MDOT 21AA dense-graded aggregate. If a stable subgrade cannot be achieved at a maximum depth of 12-inches below the proposed subgrade, we recommend placing a geogrid reinforcement, such as TENSAR Tri-Ax geogrid (Type III) or equivalent, at a depth of 12-inches below proposed subgrade and backfilling with MDOT 21AA aggregate. The geogrid should extend to a minimum of 5-feet beyond the edges of the unstable area. Any undercut areas within predominantly clayey soils should be connected with finger drains to the closest catch basins to drain water from within the granular undercut backfill material.

Pavement Drainage and Maintenance

Proper pavement drainage is essential given the predominantly cohesive soils within the site. We recommend “stub” or “finger” drains be provided around catch basins to minimize the accumulation of water above and within any frost susceptible subgrade soils. The pavement and subgrade should be properly sloped to promote effective surface and subsurface drainage and prevent water from ponding. We also recommend pavement subbase materials consist of non-frost susceptible aggregates where possible.

Regular timely maintenance should be performed on the pavement to reduce the potential deterioration associated with moisture infiltration through surface cracks. The owner should be prepared to seal the cracks with hot-applied elastic crack filler as soon as possible after cracking develops and as often as necessary to block the passage of water to the subgrade soils.

GENERAL COMMENTS

We have formulated the evaluations and recommendations presented in this report relative to site preparation and pavement design on the basis of data provided to us relating to the project location and surface grade for the proposed site. Any significant change in this data should be brought to our



attention for review and evaluation with respect to prevailing subsurface conditions. Furthermore, if changes occur in the design, location, or concept of the project, conclusions and recommendations contained in this report are not valid unless G2 Consulting Group, LLC reviews the changes. G2 Consulting Group, LLC will then confirm the recommendations presented herein or make changes in writing.

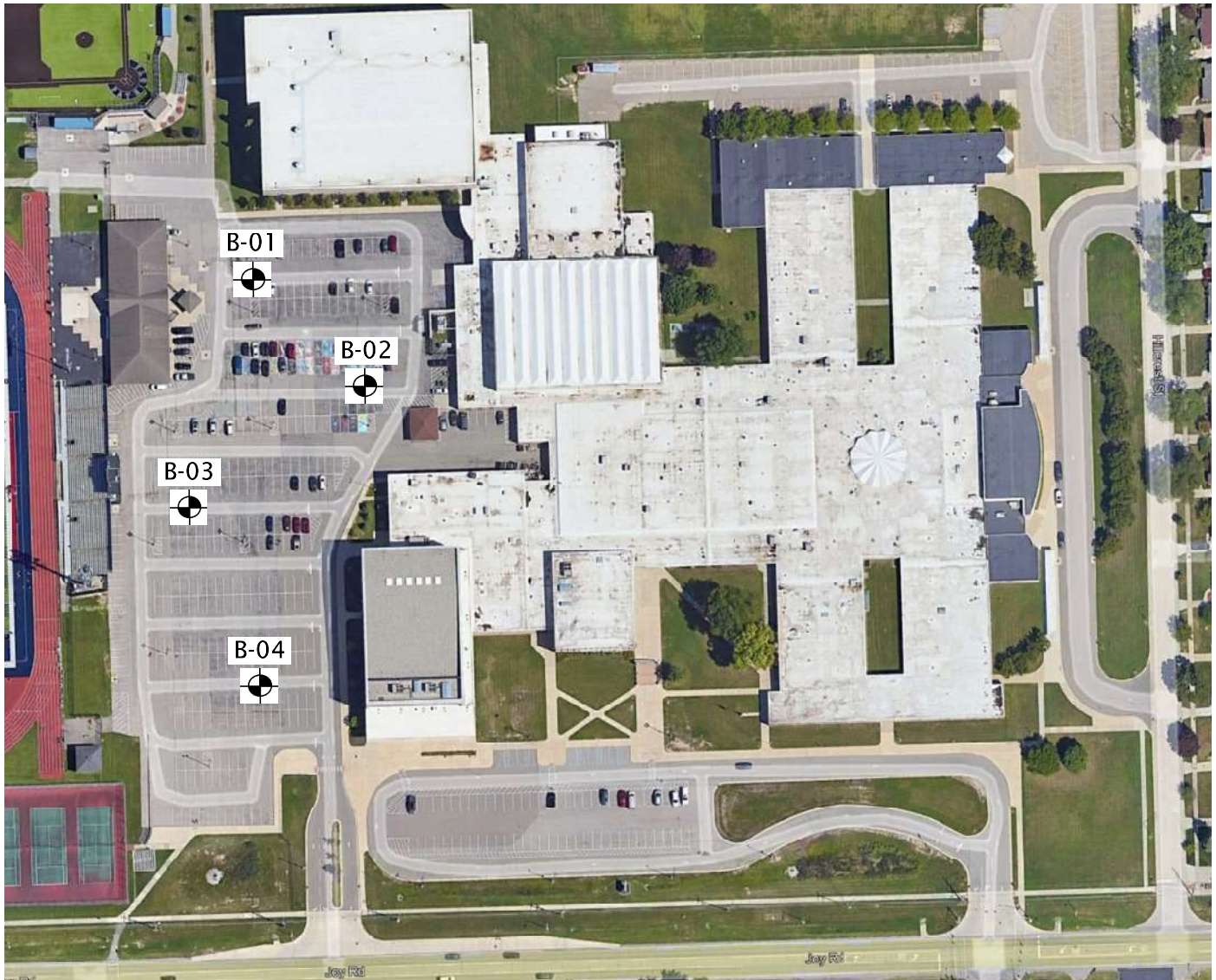
The scope of the present investigation was limited to evaluation of subsurface conditions for the support of proposed pavement improvements. No chemical, environmental, or hydrogeological testing or analyses were included in the scope of this investigation.

We base the analyses and recommendations submitted in this report upon the data from the soil borings performed at the approximate location shown on the Pavement-Core/Hand-Auger Boring Location Plan, Plate No. 1. This report does not reflect variations that may occur between and away from the actual boring locations and the actual location of pavement reconstruction. The nature and extent of any such variations may not become clear until the time of construction. If significant variations then become evident, it may be necessary for us to re-evaluate our report recommendations.


We recommend G2 Consulting Group, LLC observe all geotechnical related work, including subgrade preparation, and engineered fill placement. G2 Consulting Group, LLC will perform the appropriate testing to confirm the geotechnical conditions given in the report are found during construction.

APPENDIX

Soil Boring Location Plan	Plate No. 1
Pavement Core/Hand Auger Boring Logs	Figure Nos. 1 through 4
Grain Size Distribution Test Results	Figure No. 5
Atterberg Limit Test Results	Figure No. 6
General Notes Terminology	Figure No. 7
Photographic Documentation	Figure Nos. 8 through 11



Legend

 Pavement-core / hand-auger borings performed by G2 Consulting Group, LLC on December 10, 2024

Notes

1. Pavement-Core / Hand- Auger Borings B-01 through B-04 drilled to a depth of 5 feet each.

Pavement-Core Location Plan

Proposed Franklin High School Improvements
31000 Joy Road
Livonia, Michigan 48150



Project No. 243784

Drawn by: TSH

Date: 12/18/24

Scale: NTS

Plate
No. 1

Project Name: Franklin High School Pavement Improvements

Project Location: 31000 Joy Road
Livonia, Michigan 48150

G2 Project No. 243784

Latitude: 42.355189° Longitude: -83.346919°



Soil Boring No. B-01

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

ELEV. (ft)	PRO- FILE	GROUND SURFACE ELEVATION: 634.0 ft	DEPTH (ft)	SAMPLE TYPE/NO.	DCP BLOWS/ 1.75-INCHES	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCOF. COMP. ST. (PSF)
		Bituminous Pavement (4 inches)	0.3					
		Aggregate Base: Crushed Bituminous Concrete (7 inches)	0.9	BS-01				
		Crushed Concrete Aggregate Base: Gray Sand and Gravel with little silt (3 inches)	1.2	BS-02	17	19.2		6000*
		Fill: Very Stiff Dark Gray Silty Clay with trace sand and gravel; intermixed organic matter (Organic Matter Content = 2.4%)	2.0	BS-03	20	20.9		6000*
		Very Stiff Mottled Brown and Gray Silty Clay with trace sand and gravel, occasional sand seams (Liquid Limit = 41 , Plastic Limit =20)						
629.0			5.0	BS-04	14	27.2		4000*
		End of Boring @ 5 ft						
624.0			10					

Total Depth: 5 ft
Drilling Date: December 10, 2024
Inspector:
Contractor: G2 Consulting Group
Driller: M. Henningsen

Water Level Observation:
4 feet during drilling operations; 5 feet upon
completion

Notes:
* Calibrated Hand Penetrometer

Drilling Method:
4 inch diameter diamond-tipped core barrel; 3
inch diameter bucket hand auger

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings; capped with
cold-patch asphalt

Figure No. 1

Project Name: Franklin High School Pavement Improvements

Project Location: 31000 Joy Road
Livonia, Michigan 48150

G2 Project No. 243784

Latitude: 42.355670° Longitude: -83.347178°



Soil Boring No. B-02

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

ELEV. (ft)	PRO- FILE	GROUND SURFACE ELEVATION: 632.8 ft	DEPTH (ft)	SAMPLE TYPE/NO.	DCP BLOWS/ 1.75-INCHES	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCOF. COMP. ST. (PSF)
		Bituminous Pavement (3-3/4 inches)	0.3					
		Aggregate Base: Crushed Bituminous Concrete (4-3/4 inches)	0.7	BS-01				
		Crushed Concrete Aggregate Base: Brown Sand and Gravel with little silt (3-1/2 inches)	1.0					
		Very Stiff Mottled Brown and Gray Silty Clay with trace sand and gravel, occasional sand seams		BS-02	18	21.2		5000*
			3.0					
		Medium Mottled Brown and Gray Silty Clay with trace sand and gravel, occasional sand seams						
627.8			5.0	BS-03	6	23.8		1000*
		End of Boring @ 5 ft						
622.8			10					

Total Depth: 5 ft
Drilling Date: December 10, 2024
Inspector:
Contractor: G2 Consulting Group
Driller: M. Henningsen

Water Level Observation:
2 feet during drilling operations; 5 feet upon
completion

Notes:
* Calibrated Hand Penetrometer

Drilling Method:
4 inch diameter diamond-tipped core barrel; 3
inch diameter bucket hand auger

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings; capped with
cold-patch asphalt

Figure No. 2

Project Name: Franklin High School Pavement Improvements

Project Location: 31000 Joy Road
Livonia, Michigan 48150

G2 Project No. 243784

Latitude: 42.356026° Longitude: -83.346480°



Soil Boring No. B-03

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

ELEV. (ft)	PRO- FILE	GROUND SURFACE ELEVATION: 636.0 ft	DEPTH (ft)	SAMPLE TYPE/NO.	DCP BLOWS/ 1.75-INCHES	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCOF. COMP. ST. (PSF)
		Bituminous Pavement (4 inches)	0.3					
		Aggregate Base: Crushed Bituminous Concrete (5 inches)	0.8					
		Crushed Concrete Aggregate Base: Brown Sand and Gravel with little silt (5 inches)	1.0	BS-01				
		Fill: Stiff Brown Silty Clay with trace sand and gravel; intermixed organic matter (Organic Matter Content = 2.0%)		BS-02	12	24.5		3500*
		Fill: Stiff Black and Gray Silty Clay with trace sand and gravel; intermixed organic matter	2.8 3.0					
		Fill: Medium Gray Sandy Clay with trace silt and gravel; intermixed organic matter (Organic Matter Content = 1.5%)						
631.0			5.0	BS-03	4	22.4		1000*
		End of Boring @ 5 ft						
626.0			10					

Total Depth: 5 ft
Drilling Date: December 10, 2024
Inspector:
Contractor: G2 Consulting Group
Driller: M. Henningsen

Drilling Method:
4 inch diameter diamond-tipped core barrel; 3
inch diameter bucket hand auger

Water Level Observation:
1-1/4 feet during drilling operations; 5 feet upon
completion

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings; capped with
cold-patch asphalt

Figure No. 3

Project Name: Franklin High School Pavement Improvements

Project Location: 31000 Joy Road
Livonia, Michigan 48150

G2 Project No. 243784

Latitude: 42.356315° Longitude: -83.346954°



Soil Boring No. B-04

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

ELEV. (ft)	PRO- FILE	GROUND SURFACE ELEVATION: 634.8 ft	DEPTH (ft)	SAMPLE TYPE/NO.	DCP BLOWS/ 1.75-INCHES	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCOF. COMP. ST. (PSF)
		Bituminous Pavement (4-1/4 inches)	0.4					
		Aggregate Base: Crushed Bituminous Concrete (10-3/4 inches)	1.3	BS-01				
		Very Stiff Brown Silty Clay with trace sand and gravel	4.0	BS-02	17	22.8		5000*
629.8		Medium Brown Silty Clay with trace sand and gravel	5.0	BS-03	4	24.5		1000*
		End of Boring @ 5 ft						
624.8			10					

Total Depth: 5 ft
Drilling Date: December 10, 2024
Inspector:
Contractor: G2 Consulting Group
Driller: M. Henningsen

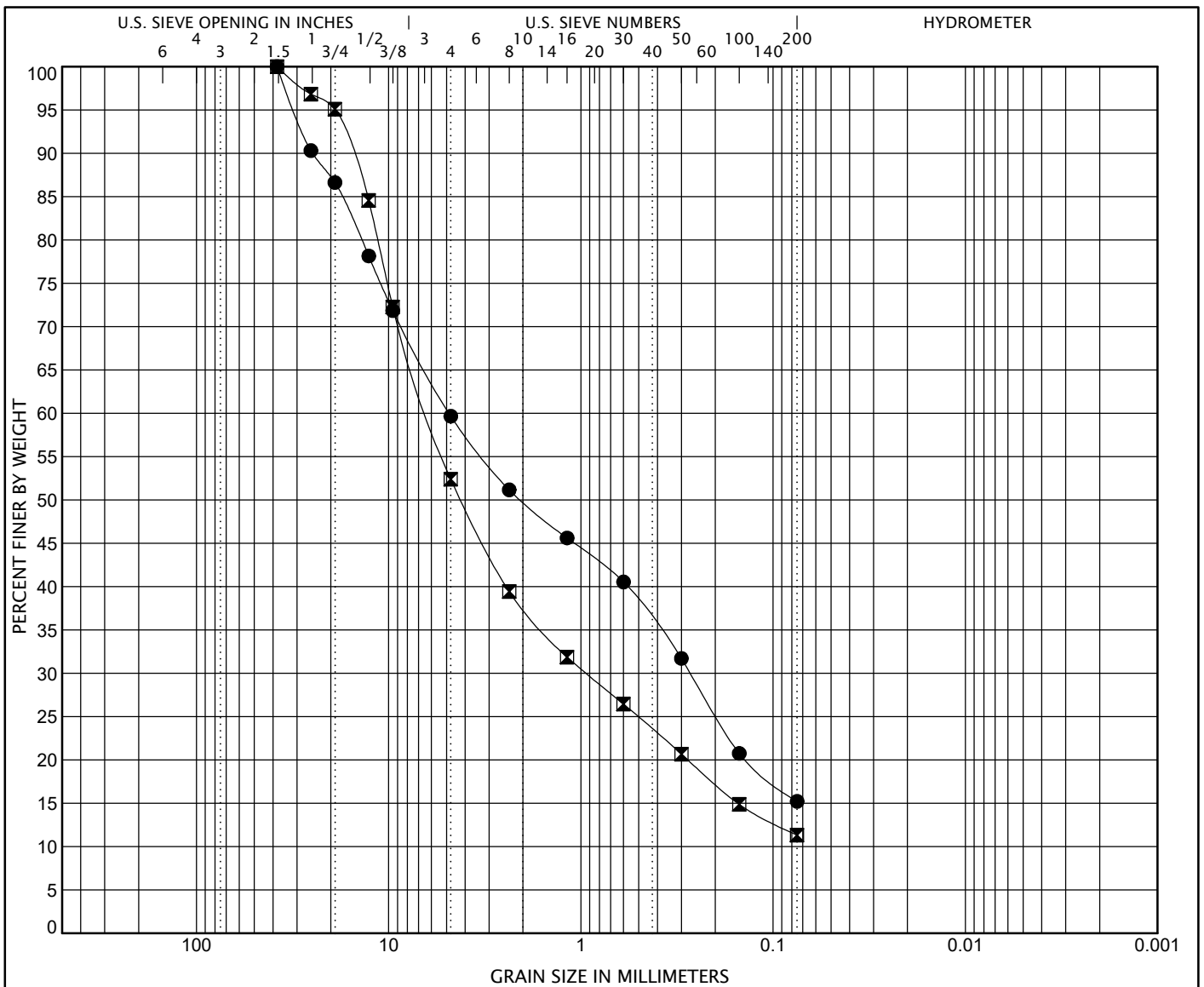
Drilling Method:
4 inch diameter diamond-tipped core barrel; 3
inch diameter bucket hand auger

Water Level Observation:
1-1/4 feet during drilling operations; 5 feet upon
completion

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings; capped with
cold-patch asphalt

Figure No. 4



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen ID	Description					LL	PL	PI	Cc	Cu
● B-01 BS-01	Gray Sand and Gravel with little silt									
☒ B-03 BS-01	Brown Sand and Gravel with little silt								2.4	107.1
Specimen ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay		
● B-01 BS-01	38.1	4.843	0.269		40.3	44.4	15.2			
☒ B-03 BS-01	38.1	6.203	0.936		47.6	41.1	11.3			



GRAIN SIZE DISTRIBUTION

Project Name: Franklin High School Pavement Improvements

Project Location: 31000 Joy Road
Livonia, Michigan 48150

G2 Project No.: 243784

Figure No. 5

GENERAL NOTES TERMINOLOGY

Unless otherwise noted, all terms herein refer to the Standard Definitions presented in ASTM 653.

PARTICLE SIZE

Boulders	- greater than 12 inches
Cobbles	- 3 inches to 12 inches
Gravel - Coarse	- 3/4 inches to 3 inches
- Fine	- No. 4 to 3/4 inches
Sand - Coarse	- No. 10 to No. 4
- Medium	- No. 40 to No. 10
- Fine	- No. 200 to No. 40
Silt	- 0.005mm to 0.074mm
Clay	- Less than 0.005mm

CLASSIFICATION

The major soil constituent is the principal noun, i.e. clay, silt, sand, gravel. The second major soil constituent and other minor constituents are reported as follows:

Second Major Constituent (percent by weight)	Minor Constituent (percent by weight)
Trace - 1 to 12%	Trace - 1 to 12%
Adjective - 12 to 35%	Little - 12 to 23%
And - over 35%	Some - 23 to 33%

COHESIVE SOILS

If clay content is sufficient so that clay dominates soil properties, clay becomes the principal noun with the other major soil constituent as modifier, i.e. sandy clay. Other minor soil constituents may be included in accordance with the classification breakdown for cohesionless soils, i.e. silty clay, trace sand, little gravel.

Consistency	Unconfined Compressive Strength (psf)	Approximate Range of (N)
Very Soft	Below 500	0 - 2
Soft	500 - 1,000	3 - 4
Medium	1,000 - 2,000	5 - 8
Stiff	2,000 - 4,000	9 - 15
Very Stiff	4,000 - 8,000	16 - 30
Hard	8,000 - 16,000	31 - 50
Very Hard	Over 16,000	Over 50

Consistency of cohesive soils is based upon an evaluation of the observed resistance to deformation under load and not upon the Standard Penetration Resistance (N).

Density Classification	COHESIONLESS SOILS Relative Density %	Approximate Range of (N)
Very Loose	0 - 15	0 - 4
Loose	16 - 35	5 - 10
Medium Compact	36 - 65	11 - 30
Compact	66 - 85	31 - 50
Very Compact	86 - 100	Over 50

Relative Density of cohesionless soils is based upon the evaluation of the Standard Penetration Resistance (N), modified as required for depth effects, sampling effects, etc.

SAMPLE DESIGNATIONS

AS -	Auger Sample - Cuttings directly from auger flight
BS -	Bottle or Bag Samples
S -	Split Spoon Sample - ASTM D 1586
LS -	Liner Sample with liner insert 3 inches in length
ST -	Shelby Tube sample - 3 inch diameter unless otherwise noted
PS -	Piston Sample - 3 inch diameter unless otherwise noted
RC -	Rock Core - NX core unless otherwise noted

STANDARD PENETRATION TEST (ASTM D 1586) - A 2.0 inch outside-diameter, 1-3/8 inch inside-diameter split barrel sampler is driven into undisturbed soil by means of a 140-pound weight falling freely through a vertical distance of 30 inches. The sampler is normally driven three successive 6-inch increments. The total number of blows required for the final 12 inches of penetration is the Standard Penetration Resistance (N).

**Photographic Documentation
Franklin High School Parking Lot Improvements
Livonia, Michigan
G2 Project No. 243784**



Photo Nos. 1 and 2 – Pavement core and surface conditions at B-01. Pavement distress consisting of medium-severity fatigue cracking, and low-severity transverse and joint cracking. View to the east.

**Photographic Documentation
Franklin High School Parking Lot Improvements
Livonia, Michigan
G2 Project No. 243784**



Photo Nos. 3 and 4 – Pavement core and surface conditions at B-02. Pavement distress consisting of high-severity fatigue and transverse cracking, and low-severity longitudinal cracking. View to the east.

**Photographic Documentation
Franklin High School Parking Lot Improvements
Livonia, Michigan
G2 Project No. 243784**



Photo Nos. 5 and 6 – Pavement core and surface conditions at B-03. Pavement distress consisting of high-severity fatigue cracking and medium-severity transverse cracking.
View to the west.

**Photographic Documentation
Franklin High School Parking Lot Improvements
Livonia, Michigan
G2 Project No. 243784**



Photo Nos. 7 and 8 – Pavement core and surface conditions at B-04. Pavement distress consisting of medium-severity fatigue cracking and low-severity transverse cracking.
View to the east.



APPENDIX C

- **Livonia Soil Erosion Worksheet**



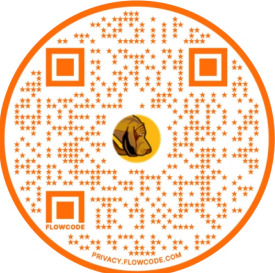
1. The subsurface utilities depicted are for informational use only. Blood Hound is not a licensed surveyor or Engineering firm. Independent verification of the provided data for any official use would be required.
2. Our subsurface utility designation was performed utilizing radio frequency (RF) and ground penetrating radar (GPR). Electromagnetic interference and subsurface soil and groundwater conditions impact the ability to identify and trace subsurface utilities.
3. Unless confirmed with test holes, any subsurface utility depths shown hereon were derived with RF or GPR methodologies and are approximate.
4. The base map imagery shown may not reflect current site conditions.
5. Designated subsurface utilities were designated using a Vivax-Metrotech vLoc3 RTK-Pro GNSS receiver, unless otherwise noted.



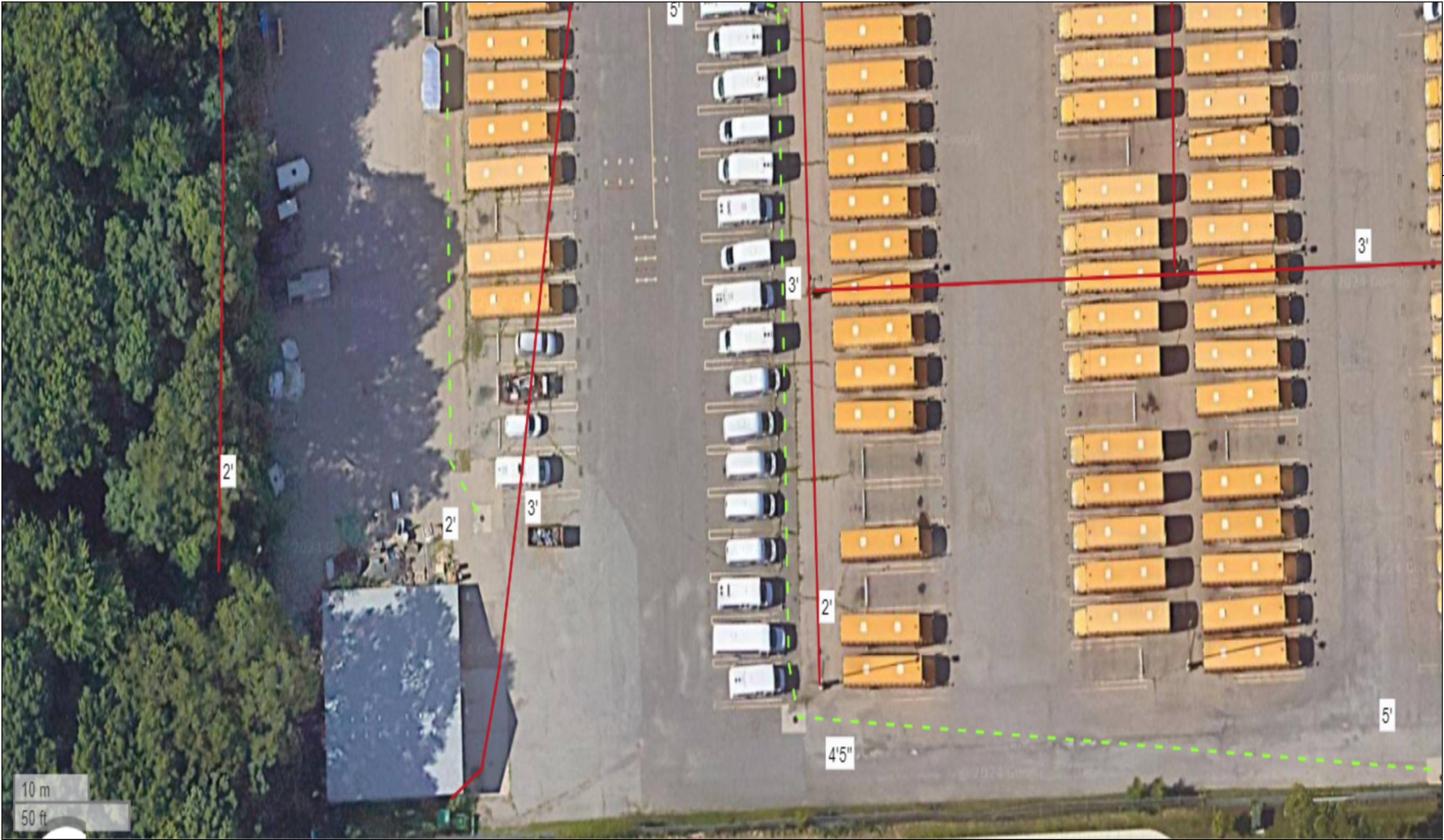
Work order# **00249879** Customer **Livonia Public Schools** Scale: **NTS**
Work type **Locating** Technician(s) **James Shutters** Address **15125 Farmington Rd, Livonia, MI, 48150**

Legend

 Note



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Work order# **00249879**

Customer **Livonia Public Schools**

Scale: **NTS**

Work type **Locating**

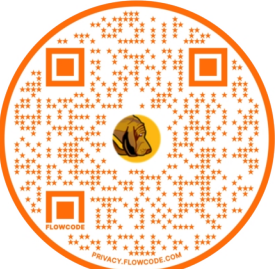
Technician(s) **James Shutters**

Address **15125 Farmington Rd, Livonia, MI, 48150**

- Legend
- Elec. Line

Note

Storm Line



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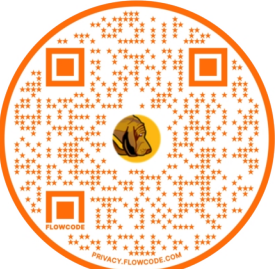
Work type **Locating**

Technician(s) **James Shutters**

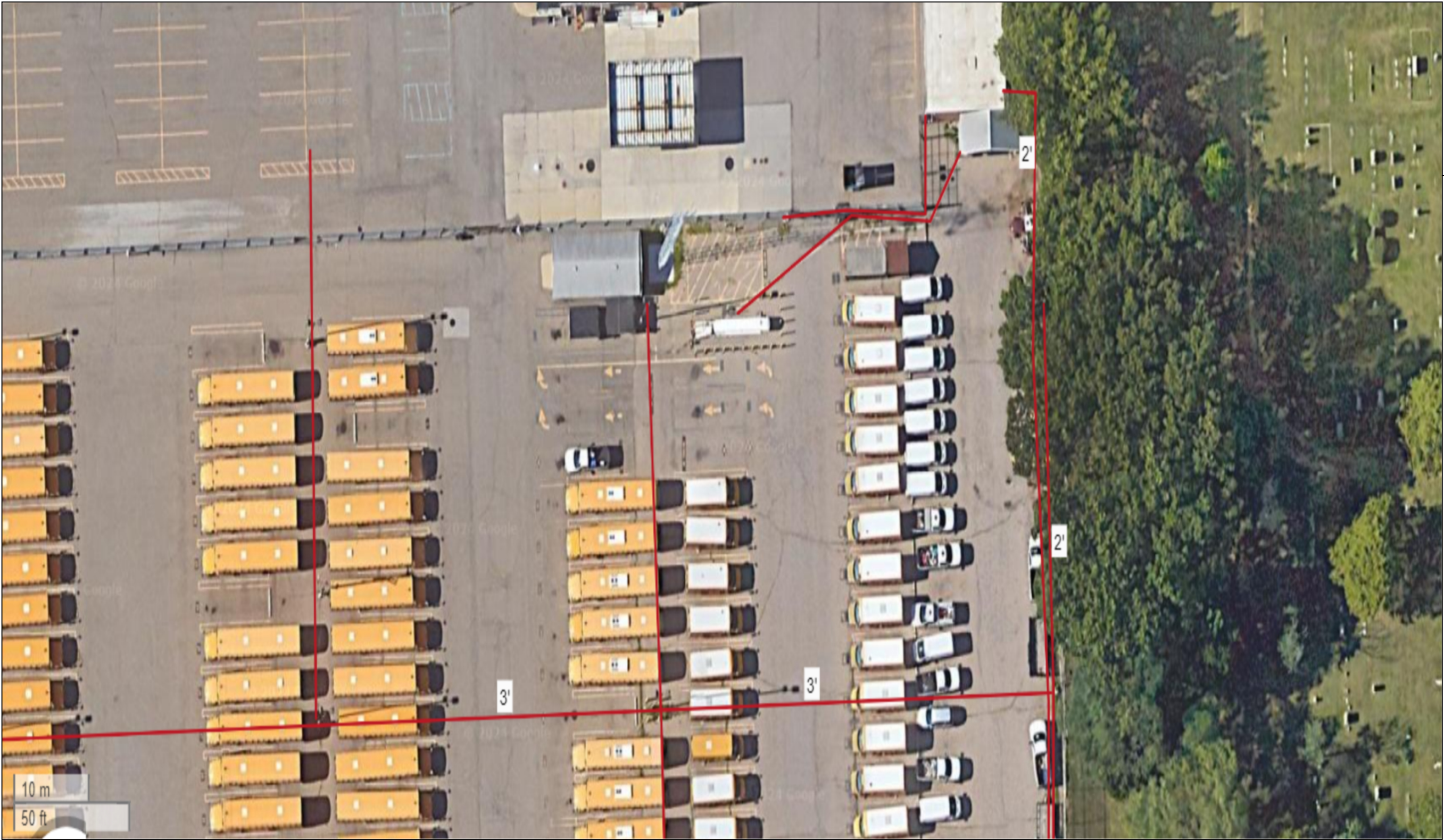
Address **15125 Farmington Rd, Livonia, MI, 48150**

Scale: **NTS**

- Legend
- Elec. Line
- Note
- Storm Line



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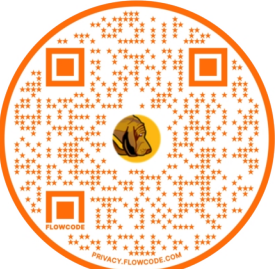
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- Legend
- Elec. Line

Note

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APPENDIX D

- **Report on Geotechnical Investigation**

CITY OF LIVONIA
ENGINEERING DIVISION
SOIL EROSION WORKSHEET

Date: _____

Project: _____

Location: _____

Approximate Size of Earth Change: _____
(acres or square feet)

Rounded-up Size of Earth Change: _____ acres

1. Plan Review:

_____	Single Family	\$50.00	_____
_____	Less than 1 acre	\$75.00	_____
_____	1 – 9 acres	\$75.00 + \$50.00 per acre over 1 acre	_____
_____	10 – 40 acres	\$500.00 + \$25.00 per acre over 10 acres	_____
_____	40 acres or more	\$1,250.00 + \$10.00 per acre over 40 acres	_____

2. Inspection:

_____	Single Family	\$135.00	_____
_____	Less than 1 acre	\$200.00	_____
_____	1 – 9 acres	\$200.00 per acre	_____
_____	10 – 40 acres	\$2,000.00 + \$100.00 per acre over 10 acres	_____
_____	40 acres or more	\$5,000.00 + \$75.00 per acre over 40 acres	_____

TOTAL FEES (REVIEW & INSPECTION): _____

3. Cash Refundable Bond:

_____	Standard	\$600.00 per Acre (\$600.00 min.)	_____
_____	Special Conditions	(i.e. near open water etc.)	_____

TOTAL BONDS (REFUNDABLE): _____