PUBLIC IMPROVEMENT REQUEST FOR PROPOSAL

RFP# 23-59

East Medical Center Drive Bridge Rehabilitation and Widening Project

City of Ann Arbor
Public Services/
Engineering

Due Date: November 16, 2023 by 11:00 a.m. (local time)

Issued By:

City of Ann Arbor
Procurement Unit
301 E. Huron Street
Ann Arbor, MI 48104

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SECTION I - GENERAL INFORMATION

A. OBJECTIVE

The purpose of this Request for Proposal is to select a firm, or firms, to provide Construction Services for the East Medical Center Drive Bridge Rehabilitation and Widening Project as described in the plans and specifications.

B. BID SECURITY

Each bid must be accompanied by a certified check or Bid Bond by a surety licensed and authorized to do business within the State of Michigan, in the amount of 5% of the total of the bid price.

Proposals that fail to provide a bid security upon proposal opening will be deemed non-responsive and will not be considered for award.

C. QUESTIONS AND CLARIFICATIONS / DESIGNATED CITY CONTACTS

All questions regarding this Request for Proposal (RFP) shall be submitted via e-mail. Questions will be accepted and answered in accordance with the terms and conditions of this RFP.

All questions shall be submitted on or before October 30, 2023 at 11:00 a.m. (local time), and should be addressed as follows:

Scope of Work/Proposal Content questions shall be e-mailed to **Francisca Chan, Project Manager** -FChan@a2gov.org

RFP Process and Compliance questions shall be e-mailed to Colin Spencer, Buyer - CSpencer@a2gov.org

Should any prospective bidder be in doubt as to the true meaning of any portion of this RFP, or should the prospective bidder find any ambiguity, inconsistency, or omission therein, the prospective bidder shall make a written request for an official interpretation or correction by the due date for questions above.

All interpretations, corrections, or additions to this RFP will be made only as an official addendum that will be posted to a2gov.org and MITN.info and it shall be the prospective bidder's responsibility to ensure they have received all addenda before submitting a proposal. Any addendum issued by the City shall become part of the RFP, and must be incorporated in the proposal where applicable.

D. PRE-PROPOSAL MEETING

A pre-proposal conference for this project will be held on **October 24, 2023 at 11:00 A.M.** This meeting will be held virtually through Microsoft Teams. Interested parties shall contact **Francisca Chan, Project Manager at fchan@a2gov.org** to receive an invitation.

Attendance at this conference is highly recommended. Administrative and technical questions regarding this project will be answered at this time. The pre-proposal conference is for information only. Any answers furnished will not be official until verified in writing by the Financial Service Area, Procurement Unit. Answers that change or substantially clarify the proposal will be affirmed in an addendum.

E. PROPOSAL FORMAT

To be considered, each firm must submit a response to this RFP using the format provided in Section III. No other distribution of proposals is to be made by the prospective bidder. An official authorized to bind the bidder to its provisions must sign the proposal. Each proposal must remain valid for at least one hundred and twenty (120) days from the due date of this RFP.

Proposals should be prepared simply and economically providing a straightforward, concise description of the bidder's ability to meet the requirements of the RFP. No erasures are permitted. Mistakes may be crossed out and corrected and must be initialed in ink by the person signing the proposal.

F. SELECTION CRITERIA

Responses to this RFP will be evaluated using a point system as shown in Section III. A selection committee comprised primarily of staff from the City will complete the evaluation.

If interviews are desired by the City, the selected firms will be given the opportunity to discuss their proposal, qualifications, past experience, and their fee proposal in more detail. The City further reserves the right to interview the key personnel assigned by the selected bidder to this project.

All proposals submitted may be subject to clarifications and further negotiation. All agreements resulting from negotiations that differ from what is represented within the RFP or in the proposal response shall be documented and included as part of the final contract.

G. SEALED PROPOSAL SUBMISSION

All proposals are due and must be delivered to the City on or before November 16, 2023 by 11:00a.m. (local time). Proposals submitted late or via oral, telephonic, telegraphic, electronic mail or facsimile **will not** be considered or accepted.

Each respondent should submit in a sealed envelope

- **one (1) original proposal**
- **one (1) digital copy of the proposal preferably on a USB/flash drive as one file in PDF format**

Proposals submitted should be clearly marked: **"RFP No. 23-59 East Medical Center Drive Bridge Rehabilitation and Widening Project"** and list the bidder's name and address.

Proposals must be addressed and delivered to:
City of Ann Arbor
c/o Customer Service
301 East Huron Street
Ann Arbor, MI 48107

All proposals received on or before the due date will be publicly opened and recorded on the due date. No immediate decisions will be rendered.

Hand delivered proposals may be dropped off in the Purchasing drop box located in the Ann Street (north) vestibule/entrance of City Hall which is open to the public Monday through Friday from 8am to 5pm (except holidays). The City will not be liable to any prospective bidder for any unforeseen circumstances, delivery, or postal delays. Postmarking on the due date will not substitute for receipt of the proposal.

Bidders are responsible for submission of their proposal. Additional time will not be granted to a single prospective bidder. However, additional time may be granted to all prospective bidders at the discretion of the City.

A proposal may be disqualified if the following required forms are not included with the proposal:

- **Attachment D - Prevailing Wage Declaration of Compliance**
- **Attachment E - Living Wage Declaration of Compliance**
- **Attachment G - Vendor Conflict of Interest Disclosure Form**
- **Attachment H - Non-Discrimination Declaration of Compliance**

Proposals that fail to provide these forms listed above upon proposal opening may be deemed non-responsive and may not be considered for award.

H. DISCLOSURES

Under the Freedom of Information Act (Public Act 442), the City is obligated to permit review of its files, if requested by others. All information in a proposal is subject to

disclosure under this provision. This act also provides for a complete disclosure of contracts and attachments thereto.

I. TYPE OF CONTRACT

A sample of the Construction Agreement is included as Attachment A. Those who wish to submit a proposal to the City are required to review this sample agreement carefully. **The City will not entertain changes to its Construction Agreement.**

For all construction work, the respondent must further adhere to the City of Ann Arbor General Conditions. The General Conditions are included herein. Retainage will be held as necessary based on individual tasks and not on the total contract value. The Contractor shall provide the required bonds included in the Contract Documents for the duration of the Contract.

The City reserves the right to award the total proposal, to reject any or all proposals in whole or in part, and to waive any informality or technical defects if, in the City's sole judgment, the best interests of the City will be so served.

This RFP and the selected bidder's response thereto, shall constitute the basis of the scope of services in the contract by reference.

J. NONDISCRIMINATION

All bidders proposing to do business with the City shall satisfy the contract compliance administrative policy adopted by the City Administrator in accordance with the Section 9:158 of the Ann Arbor City Code. Breach of the obligation not to discriminate as outlined in Attachment G shall be a material breach of the contract. Contractors are required to post a copy of Ann Arbor's Non-Discrimination Ordinance attached at all work locations where its employees provide services under a contract with the City.

K. WAGE REQUIREMENTS

The Attachments provided herein outline the requirements for payment of prevailing wages or of a "living wage" to employees providing service to the City under this contract. The successful bidder must comply with all applicable requirements and provide documentary proof of compliance when requested.

Pursuant to Resolution R-16-469 all public improvement contractors are subject to prevailing wage and will be required to provide to the City payroll records sufficient to demonstrate compliance with the prevailing wage requirements. Use of Michigan Department of Transportation Prevailing Wage Forms (sample attached hereto) or a City-approved equivalent will be required along with wage rate interviews.

For laborers whose wage level are subject to federal, state and/or local prevailing wage law the appropriate Davis-Bacon wage rate classification is identified based

upon the work including within this contract. **The wage determination(s) current on the date 10 days before proposals are due shall apply to this contract.** The U.S. Department of Labor (DOL) has provided explanations to assist with classification in the following resource link: www.wdol.gov.

For the purposes of this RFP the Construction Type of Heavy and Highway will apply.

L. CONFLICT OF INTEREST DISCLOSURE

The City of Ann Arbor Purchasing Policy requires that the consultant complete a Conflict of Interest Disclosure form. A contract may not be awarded to the selected bidder unless and until the Procurement Unit and the City Administrator have reviewed the Disclosure form and determined that no conflict exists under applicable federal, state, or local law or administrative regulation. Not every relationship or situation disclosed on the Disclosure Form may be a disqualifying conflict. Depending on applicable law and regulations, some contracts may awarded on the recommendation of the City Administrator after full disclosure, where such action is allowed by law, if demonstrated competitive pricing exists and/or it is determined the award is in the best interest of the City. A copy of the Conflict of Interest Disclosure Form is attached.

M. COST LIABILITY

The City of Ann Arbor assumes no responsibility or liability for costs incurred by the bidder prior to the execution of an Agreement. The liability of the City is limited to the terms and conditions outlined in the Agreement. By submitting a proposal, bidder agrees to bear all costs incurred or related to the preparation, submission, and selection process for the proposal.

N. DEBARMENT

Submission of a proposal in response to this RFP is certification that the Respondent is not currently debarred, suspended, proposed for debarment, and declared ineligible or voluntarily excluded from participation in this transaction by any State or Federal departments or agency. Submission is also agreement that the City will be notified of any changes in this status.

O. PROPOSAL PROTEST

All proposal protests must be in writing and filed with the Purchasing Manager within five (5) business days of any notices of intent, including, but not exclusively, divisions on prequalification of bidders, shortlisting of bidders, or a notice of intent to award. Only bidders who responded to the solicitation may file a bid protest. The bidder must clearly state the reasons for the protest. If any bidder contacts a City Service Area/Unit and indicates a desire to protest an award, the Service Area/Unit shall refer the bidder to the Purchasing Manager. The Purchasing Manager will provide the bidder with the

appropriate instructions for filing the protest. The protest shall be reviewed by the City Administrator or designee, whose decision shall be final.

Any inquiries or requests regarding this procurement should be only submitted in writing to the Designated City Contacts provided herein. Attempts by the bidder to initiate contact with anyone other than the Designated City Contacts provided herein that the bidder believes can influence the procurement decision, e.g., Elected Officials, City Administrator, Selection Committee Members, Appointed Committee Members, etc., may lead to immediate elimination from further consideration.

P. SCHEDULE

The following is the schedule for this RFP process.

Activity/Event	**Anticipated Date**
Pre-Proposal Conference	October 24, 2023 11:00 a.m. (Local Time)
Written Question Deadline	October 30, 2023 11:00 a.m. (Local Time)
Addenda Published (if needed)	Week of October 30th, 2023
Proposal Due Date	November 16, 2023 11:00 a.m. (Local Time)
Selection/Negotiations	November/December 2023
Expected City Council Authorizations	December 2023/ January 2024

The above schedule is for information purposes only and is subject to change at the City's discretion.

Q. IRS FORM W-9

The selected bidder will be required to provide the City of Ann Arbor an IRS form W-9.

R. RESERVATION OF RIGHTS

1. The City reserves the right in its sole and absolute discretion to accept or reject any or all proposals, or alternative proposals, in whole or in part, with or without cause.
2. The City reserves the right to waive, or not waive, informalities or irregularities in terms or conditions of any proposal if determined by the City to be in its best interest.
3. The City reserves the right to request additional information from any or all bidders.
4. The City reserves the right to reject any proposal that it determines to be unresponsive and deficient in any of the information requested within RFP.
5. The City reserves the right to determine whether the scope of the project will be entirely as described in the RFP, a portion of the scope, or a revised scope be implemented.
6. The City reserves the right to select one or more contractors or service providers to perform services.

7. The City reserves the right to retain all proposals submitted and to use any ideas in a proposal regardless of whether that proposal is selected. Submission of a proposal indicates acceptance by the firm of the conditions contained in this RFP, unless clearly and specifically noted in the proposal submitted.
8. The City reserves the right to disqualify proposals that fail to respond to any requirements outlined in the RFP, or failure to enclose copies of the required documents outlined within the RFP.

S. IDLEFREE ORDINANCE

The City of Ann Arbor adopted an idling reduction Ordinance that went into effect July 1, 2017. The full text of the ordinance (including exemptions) can be found at: www.a2gov.org/idlefree.

Under the ordinance, No Operator of a Commercial Vehicle shall cause or permit the Commercial Vehicle to Idle:

(a) For any period of time while the Commercial Vehicle is unoccupied; or

(b) For more than 5 minutes in any 60-minute period while the Commercial Vehicle is occupied.

In addition, generators and other internal combustion engines are covered

(1) Excluding Motor Vehicle engines, no internal combustion engine shall be operated except when it is providing power or electrical energy to equipment or a tool that is actively in use.

T. ENVIRONMENTAL COMMITMENT

The City of Ann Arbor recognizes its responsibility to minimize negative impacts on human health and the environment while supporting a vibrant community and economy. The City further recognizes that the products and services the City buys have inherent environmental and economic impacts and that the City should make procurement decisions that embody, promote, and encourage the City's commitment to the environment.

The City encourages potential vendors to bring forward emerging and progressive products and services that are best suited to the City's environmental principles.

U. MAJOR SUBCONTRACTORS

The Bidder shall identify each major subcontractor it expects to engage for this Contract if the work to be subcontracted is 15% or more of the bid sum or over $50,000, whichever is less. The Bidder also shall identify the work to be subcontracted to each major subcontractor. The Bidder shall not change or replace a subcontractor without approval by the City.

N. LIQUIDATED DAMAGES

A liquidated damages clause, as given on page C-2, Article III of the Contract, provides that the Contractor shall pay the City as liquidated damages, and not as a penalty, a sum certain per day for each and every day that the Contractor may be in default of completion of the specified work, within the time(s) stated in the Contract, or written extensions.

Liquidated damages clauses, as given in the General Conditions, provide further that the City shall be entitled to impose and recover liquidated damages for breach of the obligations under Chapter 112 of the City Code.

The liquidated damages are for the non-quantifiable aspects of any of the previously identified events and do not cover actual damages that can be shown or quantified nor are they intended to preclude recovery of actual damages in addition to the recovery of liquidated damages.

SECTION II - SCOPE OF WORK

Please see the plan set for more details.

A. Standard Specifications

All work performed under this Contract shall be performed in accordance with the Public Services Department Standard Specifications in effect at the date of availability of the contract documents stipulated in the Advertisement. All work under this Contract which is not included in these Standard Specifications, or which is performed using modifications to these Standard Specifications, shall be performed in accordance with the Detailed Specifications provided during the implementation of individual tasks under this Contract.

Copies of the Standard Specifications can be downloaded from the following web link.

https://www.a2gov.org/departments/engineering/Pages/Engineering-and-Contractor-Resources.aspx

SECTION III - MINIMUM INFORMATION REQUIRED

PROPOSAL FORMAT

The following describes the elements that should be included in each of the proposal sections and the weighted point system that will be used for evaluation of the proposals.

Bidders should organize Proposals into the following Sections:

A. Qualifications, Experience and Accountability
B. Workplace Safety
C. Workforce Development
D. Social Equity and Sustainability
E. Schedule of Pricing/Cost
F. Authorized Negotiator
G. Attachments

Bidders are strongly encouraged to provided details for all of the information requested below within initial proposals. Backup documentation may be requested at the sole discretion of the City to validate all of the responses provided herein by bidders. False statements by bidders to any of the criteria provided herein will result in the proposal being considered non-responsive and will not be considered for award.

Pursuant to Sec 1:325 of the City Code which sets forth requirements for evaluating public improvement bids, Bidders should submit the following:

A. Qualifications, Experience and Accountability - 20 Points

1. Qualifications and experience of the bidder and of key persons, management, and supervisory personnel to be assigned by the bidder.

2. References from individuals or entities the bidder has worked for within the last five (5) years including information regarding records of performance and job site cooperation.

3. Evidence of any quality control program used by the bidder and the results of any such program on the bidder's previous projects.

4. A statement from the bidder as to any major subcontractors it expects to engage including the name, work, and amount.

B. Workplace Safety – 20 Points

1. Provide a copy of the bidder's safety program, and evidence of a safety-training program for employees addressing potential hazards of the proposed job site. Bidder must identify a designated qualified safety representative responsible for bidder's safety program who serves as a contact for safety related matters.

2. Provide the bidder's Experience Modification Rating ("EMR") for the last three consecutive years. Preference within this criterion will be given to an EMR of 1.0 or less based on a three-year average.

3. Evidence that all craft labor that will be employed by the bidder for the project has, or will have prior to project commencement, completed at least an authorized 10-hour OSHA Construction Safety Course.

4. For the last three years provide a copy of any documented violations and the bidder's corrective actions as a result of inspections conducted by the Michigan Occupational Safety & Health Administration (MIOSHA), U.S. Department of Labor – Occupational Safety and Health Administration (OSHA), or any other applicable safety agency.

C. Workforce Development – 20 Points

1. Documentation as to bidder's pay rates, health insurance, pension or other retirement benefits, paid leave, or other fringe benefits to its employees.

2.. Documentation that the bidder participates in a Registered Apprenticeship Program that is registered with the United States Department of Labor Office of Apprenticeship or by a State Apprenticeship Agency recognized by the USDOL Office of Apprenticeship. USDOL apprenticeship agreements shall be disclosed to the City in the solicitation response.

3. Bidders shall disclose the number of non-craft employees who will work on the project on a 1099 basis, and the bidders shall be awarded points based on their relative reliance on 1099 work arrangements with more points assigned to companies with fewer 1099 arrangements. Bidders will acknowledge that the City may ask them to produce payroll records at points during the project to verify compliance with this section.

D. Social Equity and Sustainability – 20 Points

1. A statement from the bidder as to what percentage of its workforce resides in the City of Ann Arbor and in Washtenaw County, Michigan. The City will consider in

evaluating which bids best serve its interests, the extent to which responsible and qualified bidders employ individuals in either the city of the county. Washtenaw County jurisdiction is prioritized for evaluation purposes for this solicitation.

2. Evidence of Equal Employment Opportunity Programs for minorities, women, veterans, returning citizens, and small businesses.

3. Evidence that the bidder is an equal opportunity employer and does not discriminate on the basis of race, sex, pregnancy, age, religion, national origin, marital status, sexual orientation, gender identity or expression, height, weight, or disability.

4. The bidder's proposed use of sustainable products, technologies, or practices for the project, which reduce the impact on human health and the environment, including raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, and waste management.

5. The bidder's environmental record, including findings of violations and penalties imposed by government agencies.

E. Schedule of Pricing/Cost – 20 Points

PayItemCode	SupplementalDescription	Units	Quantity	UnitPrice	Total Price
1047051	_Certified Payroll Compliance	LSUM	1		
1047051	_Project Supervision, Max $175,000	LSUM	1		
1077060	_Relocation and Site Cleanup	Dlr	15000		
2010001	Clearing	Acre	0.2		
2040035	Guardrail, Rem	Ft	176		
2040050	Pavt, Rem	Syd	192		
2040061	Structures, Rem Portions(STR 11065)	LSUM	1		
2040080	Exploratory Investigation, Vertical	Ft	200		
2047001	_Curb and Gutter, Any Type or Size, Rem	Ft	381		
2047011	_Sidewalk and Drive, Any Type or Thickness, Rem	Syd	641		
2057002	_Machine Grading, Modified	Sta	2.3		
2057021	_Non-Hazardous Contaminated Material Handling and Disposal (LM)	Cyd	400		
2060002	Backfill, Structure, CIP	Cyd	1340		
2060010	Excavation, Fdn	Cyd	1400		
2067050	_Dewatering System, Excavation	Ea	2		
2080036	Erosion Control, Silt Fence	Ft	1289		
2087050	_Erosion Control, Inlet Protection	Ea	7		
2090001	Project Cleanup	LSUM	1		
3027021	_Aggregate Base Course, 21AA, Modified	Cyd	99		
3027021	_Sand Subbase Course, Class II, CIP	Cyd	145		
4030005	Dr Structure Cover, Adj, Case 1	Ea	2		
4030050	Dr Structure Cover, Type K	Ea	4		
4030390	Dr Structure, Temp Lowering	Ea	4		
4037050	_Dr Structure Cover, Adj	Ea	2		
4037050	_Utility Structure Cover, Adj, Case 1	Ea	1		
5012013	HMA, 3EML	Ton	146		
5012037	HMA, 5EML	Ton	244		
5017011	_Cold Milling HMA Surface, Modified	Syd	1501		
5017031	_Hand Patching, Modified	Ton	70		
6030014	Cold Milling Conc Pavt	Syd	26		
7040001	Steel Sheet Piling, Permanent	Sft	6870		
7040002	Steel Sheet Piling, Temp	Sft	360		
7040003	Steel Sheet Piling, Temp, Left in Place	Sft	520		
7057050	_Micropile, Load Test, Proof, LRFD	Ea	4		
7057050	_Micropile, Load Test, Verification, LRFD	Ea	1		
7057050	_Micropile, Type B, Furn and Install, LRFD	Ea	20		
7057051	_Micropile, Mobilization, LRFD (STR 11065)	LSUM	1		

7060001	Bridge Ltg, Furn and Rem (STR 11065)	LSUM	1		
7060002	Bridge Ltg, Oper and Maintain	Cyd	458		
7060040	Elec Grounding System	Ea	1		
7060050	Expansion Joint Device	Ft	204		
7060060	False Decking	Sft	20230		
7060092	Reinforcement, Steel, Epoxy Coated	Lb	178750		
7060100	Substructure Conc	Cyd	297		
7060110	Superstructure Conc	Cyd	114		
7060111	Superstructure Conc, Form, Finish, and Cure (STR 11065)	LSUM	1		
7060112	Superstructure Conc, Form, Finish, and Cure, Night Casting (STR 11065)	LSUM	1		
7060113	Superstructure Conc, Night Casting	Cyd	458		
7060140	Water Repellent Treatment, Penetrating	Syd	59		
7062003	Conc, Grade 4500	Cyd	33		
7067001	_Expansion Joint Device, Cover Plate, Modified	Ft	56		
7070019	Bearing, Elastomeric, 2 3/4 inch	Sin	6336		
7070021	Bearing, Elastomeric, 3 1/4 inch	Sin	5880		
7070040	Shear Developers (STR 11065)	LSUM	1		
7070050	Structural Steel, Mixed, Erect	Lb	59319		
7070051	Structural Steel, Mixed, Furn and Fab	Lb	59319		
7070070	Structural Steel, Rolled Shape, Erect	Lb	77700		
7070071	Structural Steel, Rolled Shape, Furn and Fab	Lb	77700		
7077051	Structural Steel, Galvanizing (STR 11065)	LSUM	1		
7100001	Joint Waterproofing	Sft	770		
7100003	Joint Waterproofing, Expansion	Sft	10		
7100030	Substructure Horizontal Surface Sealer (STR 11065)	Syd	93		
7110005	Bridge Railing, Aesthetic Parapet Tube	Ft	323		
7120007	Hand Chipping, Other Than Deck	Cft	130		
7120017	Patch, Forming	Sft	520		
7120020	Epoxy Ovly	Syd	1020		
7120028	Adhesive Anchoring of Horizontal Bar, 3/4 inch	Ea	92		
7120034	Adhesive Anchoring of Vertical Bar, 3/4 inch	Ea	8		
7120084	Reinforcement, Mechanical Splice	Ea	796		
7120098	Flushing Cracks, Water	Ft	150		
7120099	Structural Crack, Repr	Ft	150		
7120112	Patching Conc, C-L	Cyd	5		
7120120	Embedded Galvanic Anode	Ea	555		
7130010	Beam Plate, Seal Perimeter	Ft	2220		

8027001	_Curb and Gutter, Conc, 18 Inch, Any Type	Ft	277		
8027001	_Curb and Gutter, Conc, 24 Inch, Any Type	Ft	111		
8030030	Curb Ramp Opening, Conc	Ft	40		
8037010	_Concrete Sidewalk, 6 Inch	Sft	4713		
8037010	_Concrete Sidewalk, 8 Inch	Sft	3510		
8037010	_Detectable Warning Surface	Sft	64		
8037010	_Sidewalk Ramp, Concrete, 8 Inch	Sft	229		
8070044	Guardrail Approach Terminal, Type 2M	Ea	2		
8070052	Guardrail Departing Terminal, Type MGS	Ea	2		
8072179	Guardrail, Type MGS-8, 72 inch Post	Ft	152		
8080110	Fence, Structure	Sft	2635		
8087001	_Fence, Temp	Ft	2666		
8087001	_Post and Chain Fence, Salvage	Ft	84		
8087001	_Tree Fence, Protective	Ft	47		
8087050	_Gate, Temp	Ea	2		
8100398	Sign, Type IIA	Sft	20		
8100399	Sign, Type IIB	Sft	20		
8100402	Sign, Type III, Erect, Salv	Ea	4		
8107050	_Hospital Sign and Foundation, Relocate	Ea	2		
8110091	Pavt Mrkg, Polyurea, 4 inch, White	Ft	685		
8110092	Pavt Mrkg, Polyurea, 4 inch, Yellow	Ft	504		
8110110	Pavt Mrkg, Polyurea, 12 inch, Crosswalk	Ft	55		
8110114	Pavt Mrkg, Polyurea, 24 inch, Stop Bar	Ft	58		
8110153	Pavt Mrkg, Sprayable Thermopl, 4 inch, White	Ft	386		
8110154	Pavt Mrkg, Sprayable Thermopl, 4 inch, Yellow	Ft	602		
8110307	Rem Curing Compound, for Longit Mrkg, 4 inch	Ft	791		
8110321	Rem Curing Compound, for Spec Mrkg	Sft	211		
8110343	Rem Spec Mrkg	Sft	1000		
8110405	Pavt Mrkg, Polyurea, Lt Turn Arrow Sym	Ea	7		
8110410	Pavt Mrkg, Polyurea, Only	Ea	13		
8110412	Pavt Mrkg, Polyurea, Rt Turn Arrow Sym	Ea	6		
8110418	Pavt Mrkg, Polyurea, Thru Arrow Sym	Ea	3		
8117001	_Recessing Pavt Mrkg, Longitudinal	Ft	2219		
8117001	_Recessing Pavt Mrkg, Transverse	Ft	119		
8120012	Barricade, Type III, High Intensity, Double Sided, Lighted, Furn	Ea	12		
8120013	Barricade, Type III, High Intensity, Double Sided, Lighted, Oper	Ea	12		
8120026	Pedestrian Type II Barricade, Temp	Ea	4		

8120027	Pedestrian Type II Channelizer, Temp	Ft	60		
8120035	Channelizing Device, 42 inch, Fluorescent, Furn	Ea	50		
8120036	Channelizing Device, 42 inch, Fluorescent, Oper	Ea	50		
8120040	Conc Barrier Ending, Temp, Det 2, Adj	Ea	2		
8120041	Conc Barrier Ending, Temp, Det 2, Furn	Ea	2		
8120042	Conc Barrier Ending, Temp, Det 2, Oper	Ea	2		
8120080	Conc Barrier, Temp, Adj	Ft	100		
8120081	Conc Barrier, Temp, Furn	Ft	100		
8120082	Conc Barrier, Temp, Oper	Ft	100		
8120140	Lighted Arrow, Type C, Furn	Ea	2		
8120141	Lighted Arrow, Type C, Oper	Ea	2		
8120160	Ltg for Night Work	LSUM	1		
8120170	Minor Traf Devices, Max $50,000	LSUM	1		
8120210	Pavt Mrkg, Longit, 6 inch or Less Width, Rem	Ft	1940		
8120211	Pavt Mrkg, Longit, Greater than 6 inch Width, Rem	Ft	30		
8120245	Pavt Mrkg, Wet Reflective, Type R, Tape, 4 inch, White, Temp	Ft	2755		
8120246	Pavt Mrkg, Wet Reflective, Type R, Tape, 4 inch, Yellow, Temp	Ft	4222		
8120252	Plastic Drum, Fluorescent, Furn	Ea	50		
8120253	Plastic Drum, Fluorescent, Oper	Ea	50		
8120257	Pavt Mrkg, Wet Reflective, Type R, Tape, Lt Turn Arrow	Ea	11		
8120258	Pavt Mrkg, Wet Reflective, Type R, Tape, Rt Turn Arrow	Ea	2		
8120259	Pavt Mrkg, Wet Reflective, Type R, Tape, Thru Arrow	Ea	22		
8120265	Pavt Mrkg, Wet Reflective, Type R, Tape, 24 inch, Stop Bar	Ft	195		
8120310	Sign Cover	Ea	1		
8120330	Sign, Portable, Changeable Message, Furn	Ea	4		
8120331	Sign, Portable, Changeable Message, Oper	Ea	4		
8120340	Sign, Type A, Temp, Prismatic, Furn	Sft	30		
8120341	Sign, Type A, Temp, Prismatic, Oper	Sft	30		
8120350	Sign, Type B, Temp, Prismatic, Furn	Sft	1022		
8120351	Sign, Type B, Temp, Prismatic, Oper	Sft	1022		
8120352	Sign, Type B, Temp, Prismatic, Spec, Furn	Sft	386		
8120353	Sign, Type B, Temp, Prismatic, Spec, Oper	Sft	386		
8120370	Traf Regulator Control	LSUM	1		

8121000	Conc Barrier, Temp, Limited Deflection, Det 1, Furn	Ft	160		
8121001	Conc Barrier, Temp, Limited Deflection, Det 1, Oper	Ft	160		
8121100	Conc Barrier, Temp, Limited Deflection, Det 2, Furn	Ft	75		
8121101	Conc Barrier, Temp, Limited Deflection, Det 2, Oper	Ft	75		
8121102	Conc Barrier, Temp, Limited Deflection, Det 2, Adj	Ft	75		
8121200	Conc Barrier, Temp, Limited Deflection, Det 3A, Furn	Ft	160		
8121201	Conc Barrier, Temp, Limited Deflection, Det 3A, Oper	Ft	160		
8122111	Pavt Mrkg, Wet Reflective, Type R, Tape, Only	Ea	4		
8122145	Pavt Mrkg, Wet Reflective, Type R, Tape, Rt and Lt Turn Arrow Sym	Ea	2		
8122148	Pavt Mrkg, Wet Reflective, Type R, Tape, Thru and Rt Turn Arrow Sym	Ea	11		
8127050	_Pedestrian Type II Barricade, Temp	Ea	2		
8127060	_Railroad Inspection and Flagging	Dlr	200000		
8130015	Slope Paving Header	Ft	127		
8130020	Slope Paving, Conc	Syd	50		
8167011	_Slope Restoration	Syd	250		
8182000	Conduit, Rem	Ft	510		
8182016	Conduit, Encased, 1, 4 inch	Ft	207		
8182021	Conduit, Encased, 6, 4 inch	Ft	129		
8182034	Conduit, Directional Bore, 1, 1 1/2 inch	Ft	60		
8182035	Conduit, Directional Bore, 1, 3 inch	Ft	365		
8182048	Conduit, DB, 1, 1 1/2 inch	Ft	90		
8182097	Conduit, Schedule 80, 4 inch, Structure	Ft	2940		
8182133	Conduit, Schedule 40, 2 inch	Ft	545		
8182135	Conduit, Schedule 40, 3 inch	Ft	1018		
8182187	DB Cable, in Conduit, 600V, 1/C#6	Ft	4155		
8182309	Hh, Polymer Conc	Ea	3		
8182330	Hh, Rem	Ea	3		
8182349	Wood Pole, Cl 4, 30 foot	Ea	5		
8182363	Wood Pole, Rem	Ea	5		
8182387	Wood Pole, Fit Up, TS Cable Pole	Ea	3		
8187001	_Conduit, DB, 1, 2 inch	Ft	8		
8187050	_Handhole Assembly, 17 inch x 30 inch	Ea	14		
8187050	_Handhole, Adjust, Any Size	Ea	1		

8187050	_Hh, Tap, 4 inch	Ea	2		
8197050	_Luminaire Installation	Ea	5		
8197050	_Pole Fit-Up	Ea	5		
8197050	_Pole Installation	Ea	5		
8197050	_Streetlight, Rem	Ea	5		
8200100	Pedestal, Alum	Ea	3		
8200101	Pedestal, Alum, Salv	Ea	1		
8200105	Pedestal, Fdn	Ea	3		
8200106	Pedestal Fdn, Rem	Ea	4		
8200110	Pedestal, Rem	Ea	4		
8200121	Pushbutton and Sign	Ea	3		
8200122	Pushbutton, Rem	Ea	4		
8200126	Pushbutton and Sign, Salv	Ea	1		
8200140	Span Wire	Ea	4		
8200141	Span Wire, Rem	Ea	4		
8200168	Strut Guy	Ea	2		
8200177	TS, Mast Arm Mtd, Rem	Ea	1		
8200251	TS, One Way Mast Arm Mtd, Salv	Ea	1		
8200376	Bracket, Truss, with 12 foot Arm	Ea	1		
8200444	Hemispherical Video Detection Camera	Ea	3		
8200445	Hemispherical Video Detection System	Ea	1		
8200446	Hemispherical Video Detection Camera, Rem	Ea	1		
8200452	TS Head, Adj	Ea	2		
8200453	TS Head, Temp	Ea	20		
8200458	TS Face, Bag	Ea	6		
8200459	TS Face, Bag, Rem	Ea	6		
8240020	Structure Survey During Construction (STR 11065)	LSUM	1		
8507010	_Soil Nails for Slope Stabilization	Sft	2831		
8507051	_Audio-Video Rte Survey	LSUM	1		
8507051	_General Conditions, Max $650,000	LSUM	1		
8507060	_Allowance for Unforeseen Site Conditions	Dlr	100000		
	Total				

F. AUTHORIZED NEGOTIATOR / NEGOTIATIBLE ELEMENTS (ALTERNATES)

Include the name, phone number, and e-mail address of persons(s) in your organization authorized to negotiate the agreement with the City.

The proposal price shall include materials and equipment selected from the designated items and manufacturers listed in the bidding documents. This is done to establish uniformity in bidding and to establish standards of quality for the items named.

If the bidder wishes to quote alternate items for consideration by the City, it may do so under this Section. A complete description of the item and the proposed price differential must be provided. Unless approved at the time of award, substitutions where items are specifically named will be considered only as a negotiated change in Contract Sum.

If the Bidder takes exception to the time stipulated in Article III of the Contract, Time of Completion, page C-2, it is requested to stipulate its proposed time for performance of the work.

Consideration for any proposed alternative items or time may be negotiated at the discretion of the City.

G. ATTACHMENTS

General Declaration, Legal Status of Bidder, Conflict of Interest Form, Living Wage Compliance Form, Prevailing Wage Compliance Form and the Non-Discrimination Form should be completed and returned with the proposal. These elements should be included as attachments to the proposal submission.

PROPOSAL EVALUATION

1. The selection committee will evaluate each proposal by the above-described criteria and point system. The City reserves the right to reject any proposal that it determines to be unresponsive and deficient in any of the information requested for evaluation. A proposal with all the requested information does not guarantee the proposing firm to be a candidate for an interview if interviews are selected to be held by the City. The committee may contact references to verify material submitted by the bidder.

2. The committee then will schedule interviews with the selected firms if necessary. The selected firms will be given the opportunity to discuss in more detail their qualifications, past experience, proposed work plan (if applicable) and pricing.

3. The interview should include the project team members expected to work on the project, but no more than six members total. The interview shall consist of a

presentation of up to thirty minutes (or the length provided by the committee) by the bidder, including the person who will be the project manager on this contract, followed by approximately thirty minutes of questions and answers. Audiovisual aids may be used during the oral interviews. The committee may record the oral interviews.

4. The firms interviewed will then be re-evaluated by the above criteria and adjustments to scoring will be made as appropriate. After evaluation of the proposals, further negotiation with the selected firm may be pursued leading to the award of a contract by City Council, if suitable proposals are received.

The City reserves the right to waive the interview process and evaluate the bidder based on their proposal and pricing schedules alone.

The City will determine whether the final scope of the project to be negotiated will be entirely as described in this RFP, a portion of the scope, or a revised scope.

Work to be done under this contract is generally described through the detailed specifications and must be completed fully in accordance with the contract documents.

Any proposal that does not conform fully to these instructions may be rejected.

PREPARATION OF PROPOSALS

Proposals should have no plastic bindings but will not be rejected as non-responsive for being bound. Staples or binder clips are acceptable. Proposals should be printed double sided on recycled paper.

Each person signing the proposal certifies that they are a person in the bidder's firm/organization responsible for the decisions regarding the fees being offered in the Proposal and has not and will not participate in any action contrary to the terms of this provision.

ADDENDA

If it becomes necessary to revise any part of the RFP, notice of the addendum will be posted to Michigan Inter-governmental Trade Network (MITN) www.mitn.info and/or the City of Ann Arbor web site www.A2gov.org for all parties to download.

Each bidder should acknowledge in its proposal all addenda it has received on the General Declarations form provided in the Attachments section herein. The failure of a bidder to receive or acknowledge receipt of any addenda shall not relieve the bidder of the responsibility for complying with the terms thereof. The City will not be bound by oral responses to inquiries or written responses other than official written addenda.

SECTION IV - ATTACHMENTS

Attachment A – Sample Standard Contract

Attachment B – General Declarations

Attachment C - Legal Status of Bidder

Attachment D – Prevailing Wage Declaration of Compliance Form

Attachment E – Living Wage Declaration of Compliance Form

Attachment F – Living Wage Ordinance Poster

Attachment G – Vendor Conflict of Interest Disclosure Form

Attachment H – Non-Discrimination Ordinance Declaration of Compliance Form

Attachment I – Non-Discrimination Ordinance Poster

Sample Certified Payroll Report Template

ATTACHMENT A
SAMPLE STANDARD CONTRACT

If a contract is awarded, the selected contractor will be required to adhere to a set of general contract provisions which will become a part of any formal agreement. These provisions are general principles which apply to all contractors of service to the City of Ann Arbor such as the following:

Administrative Use Only
Contract Date: _____

CONTRACT

THIS CONTRACT is between the CITY OF ANN ARBOR, a Michigan Municipal Corporation, 301 East Huron Street, Ann Arbor, Michigan 48104 ("City") and _____ _____("Contractor")

(An individual/partnership/corporation, include state of incorporation) (Address)

Based upon the mutual promises below, the Contractor and the City agree as follows:

ARTICLE I - Scope of Work

The Contractor agrees to furnish all of the materials, equipment and labor necessary; and to abide by all the duties and responsibilities applicable to it for the project titled **[Insert Title of Bid and Bid Number**] in accordance with the requirements and provisions of the following documents, including all written modifications incorporated into any of the documents, all of which are incorporated as part of this Contract:

Non-discrimination and Living Wage Declaration of Compliance Forms (if applicable)
Vendor Conflict of Interest Form
Prevailing Wage Declaration of Compliance Form (if applicable)
Bid Forms
Contract and Exhibits
Bonds
General Conditions
Standard Specifications
Detailed Specifications
Plans
Addenda

ARTICLE II - Definitions

Administering Service Area/Unit means **[Insert Name of Administering Service Unit]**

Project means **[Insert Title of Bid and Bid Number]**

Supervising Professional means the person acting under the authorization of the manager of the Administering Service Area/Unit. At the time this Contract is executed,

the Supervising Professional is: [**Insert the person's name**] whose job title is [**Insert job title**]. If there is any question concerning who the Supervising Professional is, Contractor shall confirm with the manager of the Administering Service Area/Unit.

Contractor's Representative means _____ [**Insert name**] whose job title is [**Insert job title**].

ARTICLE III - Time of Completion

(A) The work to be completed under this Contract shall begin immediately on the date specified in the Notice to Proceed issued by the City.

(B) The entire work for this Contract shall be completed within _____ ( ) consecutive calendar days.

(C) Failure to complete all the work within the time specified above, including any extension granted in writing by the Supervising Professional, shall obligate the Contractor to pay the City, as liquidated damages and not as a penalty, an amount equal to $_____ for each calendar day of delay in the completion of all the work. If any liquidated damages are unpaid by the Contractor, the City shall be entitled to deduct these unpaid liquidated damages from the monies due the Contractor.

The liquidated damages are for the non-quantifiable aspects of any of the previously identified events and do not cover actual damages that can be shown or quantified nor are they intended to preclude recovery of actual damages in addition to the recovery of liquidated damages.

ARTICLE IV - The Contract Sum

(A) The City shall pay to the Contractor for the performance of the Contract, the unit prices as given in the Bid Form for the estimated bid total of:

_____Dollars ($_____)

(B) The amount paid shall be equitably adjusted to cover changes in the work ordered by the Supervising Professional but not required by the Contract Documents. Increases or decreases shall be determined only by written agreement between the City and Contractor.

ARTICLE V - Assignment

This Contract may not be assigned or subcontracted any portion of any right or obligation under this contract without the written consent of the City. Notwithstanding any consent by the City to any assignment, Contractor shall at all times remain bound to all warranties, certifications, indemnifications, promises and performances, however described, as are required of it under this contract unless specifically released from the requirement, in writing, by the City.

ARTICLE VI - Choice of Law

This Contract shall be construed, governed, and enforced in accordance with the laws of the State of Michigan. By executing this Contract, the Contractor and the City agree to venue in a court of appropriate jurisdiction sitting within Washtenaw County for purposes of any action arising under this Contract. The parties stipulate that the venue referenced in this Contract is for convenience and waive any claim of non-convenience.

Whenever possible, each provision of the Contract will be interpreted in a manner as to be effective and valid under applicable law. The prohibition or invalidity, under applicable law, of any provision will not invalidate the remainder of the Contract.

ARTICLE VII - Relationship of the Parties

The parties of the Contract agree that it is not a Contract of employment but is a Contract to accomplish a specific result. Contractor is an independent Contractor performing services for the City. Nothing contained in this Contract shall be deemed to constitute any other relationship between the City and the Contractor.

Contractor certifies that it has no personal or financial interest in the project other than the compensation it is to receive under the Contract. Contractor certifies that it is not, and shall not become, overdue or in default to the City for any Contract, debt, or any other obligation to the City including real or personal property taxes. City shall have the right to set off any such debt against compensation awarded for services under this Contract.

ARTICLE VIII - Notice

All notices given under this Contract shall be in writing, and shall be by personal delivery or by certified mail with return receipt requested to the parties at their respective addresses as specified in the Contract Documents or other address the Contractor may specify in writing. Notice will be deemed given on the date when one of the following first occur: (1) the date of actual receipt; or (2) three days after mailing certified U.S. mail.

ARTICLE IX - Indemnification

To the fullest extent permitted by law, Contractor shall indemnify, defend and hold the **City and the Regents of the University of Michigan** and their respective officers, employees and agents harmless from all suits, claims, judgments and expenses including attorney's fees resulting or alleged to result, in whole or in part, from any act or omission, which is in any way connected or associated with this Contract, by the Contractor or anyone acting on the Contractor's behalf under this Contract. Contractor shall not be responsible to indemnify the City for losses or damages caused by or resulting from the City's sole negligence. The provisions of this Article shall survive the expiration or earlier termination of this contract for any reason.

ARTICLE X - Entire Agreement

This Contract represents the entire understanding between the City and the Contractor and it supersedes all prior representations, negotiations, agreements, or understandings whether written or oral. Neither party has relied on any prior representations in entering into this Contract. No terms or conditions of either party's invoice, purchase order or other administrative document shall modify the terms and conditions of this Contract, regardless of the other party's failure to object to such form. This Contract shall be binding on and shall inure to the benefit of the parties

to this Contract and their permitted successors and permitted assigns and nothing in this Contract, express or implied, is intended to or shall confer on any other person or entity any legal or equitable right, benefit, or remedy of any nature whatsoever under or by reason of this Contract. This Contract may be altered, amended or modified only by written amendment signed by the City and the Contractor.

ARTICLE XI – Electronic Transactions

The City and Contractor agree that signatures on this Contract may be delivered electronically in lieu of an original signature and agree to treat electronic signatures as original signatures that bind them to this Contract. This Contract may be executed and delivered by facsimile and upon such delivery, the facsimile signature will be deemed to have the same effect as if the original signature had been delivered to the other party.

FOR CONTRACTOR

By_____

Its:_____

FOR THE CITY OF ANN ARBOR

By_____
Christopher Taylor, Mayor

By_____
Jacqueline Beaudry, City Clerk

Approved as to substance

By_____

City Administrator

By_____

Services Area Administrator

Approved as to form and content

_____
Atleen Kaur, City Attorney

PERFORMANCE BOND

(1) _____ of _____ (referred to as "Principal"), and _____, a corporation duly authorized to do business in the State of Michigan (referred to as "Surety"), are bound to the City of Ann Arbor, Michigan (referred to as "City"), for $, the payment of which Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, by this bond.

(2) The Principal has entered a written Contract with the City entitled _____ _____, for RFP No. _____ and this bond is given for that Contract in compliance with Act No. 213 of the Michigan Public Acts of 1963, as amended, being MCL 129.201 et seq.

(3) Whenever the Principal is declared by the City to be in default under the Contract, the Surety may promptly remedy the default or shall promptly:

(a) complete the Contract in accordance with its terms and conditions; or

(b) obtain a bid or bids for submission to the City for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, arrange for a Contract between such bidder and the City, and make available, as work progresses, sufficient funds to pay the cost of completion less the balance of the Contract price; but not exceeding, including other costs and damages for which Surety may be liable hereunder, the amount set forth in paragraph 1.

(4) Surety shall have no obligation to the City if the Principal fully and promptly performs under the Contract.

(5) Surety agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder, or the specifications accompanying it shall in any way affect its obligations on this bond, and waives notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work, or to the specifications.

(6) Principal, Surety, and the City agree that signatures on this bond may be delivered electronically in lieu of an original signature and agree to treat electronic signatures as original signatures that bind them to this bond. This bond may be executed and delivered by facsimile and upon such delivery, the facsimile signature will be deemed to have the same effect as if the original signature had been delivered to the other party.

SIGNED AND SEALED this _____ day of _____, 202_.

_____	_____
(Name of Surety Company)	(Name of Principal)
By _____	By _____
(Signature)	(Signature)
Its _____	Its _____
(Title of Office)	(Title of Office)
Approved as to form:	Name and address of agent:
_____	_____
Atleen Kaur, City Attorney	

LABOR AND MATERIAL BOND

(1) _____

of _____(referred to as "Principal"), and _____, a corporation duly authorized to do business in the State of Michigan, (referred to as "Surety"), are bound to the City of Ann Arbor, Michigan (referred to as "City"), for the use and benefit of claimants as defined in Act 213 of Michigan Public Acts of 1963, as amended, being MCL 129.201 et seq., in the amount of

$ _____, for the payment of which Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, by this bond.

(2) The Principal has entered a written Contract with the Cityentitled _____

_____

_____

____, for RFP No. _____; and this bond is given for that Contract in compliance with Act No. 213 of the Michigan Public Acts of 1963 as amended;

(3) If the Principal fails to promptly and fully repay claimants for labor and material reasonably required under the Contract, the Surety shall pay those claimants.

(4) Surety's obligations shall not exceed the amount stated in paragraph 1, and Surety shall have no obligation if the Principal promptly and fully pays the claimants.

(5) Principal, Surety, and the City agree that signatures on this bond may be delivered electronically in lieu of an original signature and agree to treat electronic signatures as original signatures that bind them to this bond. This bond may be executed and delivered by facsimile and upon such delivery, the facsimile signature will be deemed to have the same effect as if the original signature had been delivered to the other party.

SIGNED AND SEALED this _____ day of _____, 202_

_____	_____
(Name of Surety Company)	(Name of Principal)
By _____	By _____
(Signature)	(Signature)
Its _____	Its _____
(Title of Office)	(Title of Office)

Approved as to form:

Atleen Kaur, City Attorney

Name and address of agent:

GENERAL CONDITIONS

Section 1 - Execution, Correlation and Intent of Documents

The contract documents shall be signed in 2 copies by the City and the Contractor.

The contract documents are complementary and what is called for by any one shall be binding. The intention of the documents is to include all labor and materials, equipment and transportation necessary for the proper execution of the work. Materials or work described in words which so applied have a well-known technical or trade meaning have the meaning of those recognized standards.

In case of a conflict among the contract documents listed below in any requirement(s), the requirement(s) of the document listed first shall prevail over any conflicting requirement(s) of a document listed later.

(1) Addenda in reverse chronological order; (2) Detailed Specifications; (3) Standard Specifications; (4) Plans; (5) General Conditions; (6) Contract; (7) Bid Forms; (8) Bond Forms; (9) Bid.

Section 2 - Order of Completion

The Contractor shall submit with each invoice, and at other times reasonably requested by the Supervising Professional, schedules showing the order in which the Contractor proposes to carry on the work. They shall include the dates at which the Contractor will start the several parts of the work, the estimated dates of completion of the several parts, and important milestones within the several parts.

Section 3 - Familiarity with Work

The Bidder or its representative shall make personal investigations of the site of the work and of existing structures and shall determine to its own satisfaction the conditions to be encountered, the nature of the ground, the difficulties involved, and all other factors affecting the work proposed under this Contract. The Bidder to whom this Contract is awarded will not be entitled to any additional compensation unless conditions are clearly different from those which could reasonably have been anticipated by a person making diligent and thorough investigation of the site.

The Bidder shall immediately notify the City upon discovery, and in every case prior to submitting its Bid, of every error or omission in the bidding documents that would be identified by a reasonably competent, diligent Bidder. In no case will a Bidder be allowed the benefit of extra compensation or time to complete the work under this Contract for extra expenses or time spent as a result of the error or omission.

Section 4 - Wage Requirements

Under this Contract, the Contractor shall conform to Chapter 14 of Title I of the Code of the City of Ann Arbor as amended; which in part states "...that all craftsmen, mechanics and laborers employed directly on the site in connection with said improvements, including said employees of

subcontractors, shall receive the prevailing wage for the corresponding classes of craftsmen, mechanics and laborers, as determined by statistics for the Ann Arbor area compiled by the United States Department of Labor. At the request of the City, any contractor or subcontractor shall provide satisfactory proof of compliance with the contract provisions required by the Section.

Pursuant to Resolution R-16-469 all public improvement contractors are subject to prevailing wage and will be required to provide to the City payroll records sufficient to demonstrate compliance with the prevailing wage requirements. A sample Prevailing Wage Form is provided in the Appendix herein for reference as to what will be expected from contractors. Use of the Prevailing Wage Form provided in the Appendix section or a City-approved equivalent will be required along with wage rate interviews.

Where the Contract and the Ann Arbor City Ordinance are silent as to definitions of terms required in determining contract compliance with regard to prevailing wages, the definitions provided in the Davis-Bacon Act as amended (40 U.S.C. 278-a to 276-a-7) for the terms shall be used.

If the Contractor is a “covered employer” as defined in Chapter 23 of the Ann Arbor City Code, the Contractor agrees to comply with the living wage provisions of Chapter 23 of the Ann Arbor City Code. The Contractor agrees to pay those employees providing Services to the City under this Contract a “living wage,” as defined in Section 1:815 of the Ann Arbor City Code, as adjusted in accordance with Section 1:815(3); to post a notice approved by the City of the applicability of Chapter 23 in every location in which regular or contract employees providing services under this Contract are working; to maintain records of compliance; if requested by the City, to provide documentation to verify compliance; to take no action that would reduce the compensation, wages, fringe benefits, or leave available to any employee or person contracted for employment in order to pay the living wage required by Section 1:815; and otherwise to comply with the requirements of Chapter 23.

Contractor agrees that all subcontracts entered into by the Contractor shall contain similar wage provision covering subcontractor’s employees who perform work on this contract.

Section 5 - Non-Discrimination

The Contractor agrees to comply, and to require its subcontractor(s) to comply, with the nondiscrimination provisions of MCL 37.2209. The Contractor further agrees to comply with the provisions of Section 9:158 of Chapter 112 of Title IX of the Ann Arbor City Code, and to assure that applicants are employed and that employees are treated during employment in a manner which provides equal employment opportunity.

Section 6 - Materials, Appliances, Employees

Unless otherwise stipulated, the Contractor shall provide and pay for all materials, labor, water, tools, equipment, light, power, transportation, and other facilities necessary or used for the execution and completion of the work. Unless otherwise specified, all materials incorporated in the permanent work shall be new, and both workmanship and materials shall be of the highest quality. The Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of materials.

The Contractor shall at all times enforce strict discipline and good order among its employees, and shall seek to avoid employing on the work any unfit person or anyone not skilled in the work assigned.

Adequate sanitary facilities shall be provided by the Contractor.

Section 7 - Qualifications for Employment

The Contractor shall employ competent laborers and mechanics for the work under this Contract. For work performed under this Contract, employment preference shall be given to qualified local residents.

Section 8 - Royalties and Patents

The Contractor shall pay all royalties and license fees. It shall defend all suits or claims for infringements of any patent rights and shall hold the City harmless from loss on account of infringement except that the City shall be responsible for all infringement loss when a particular process or the product of a particular manufacturer or manufacturers is specified, unless the City has notified the Contractor prior to the signing of the Contract that the particular process or product is patented or is believed to be patented.

Section 9 - Permits and Regulations

The Contractor must secure and pay for all permits, permit or plan review fees and licenses necessary for the prosecution of the work. These include but are not limited to City building permits, right-of-way permits, lane closure permits, right-of-way occupancy permits, and the like. The City shall secure and pay for easements shown on the plans unless otherwise specified.

The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work as drawn and specified. If the Contractor observes that the contract documents are at variance with those requirements, it shall promptly notify the Supervising Professional in writing, and any necessary changes shall be adjusted as provided in the Contract for changes in the work.

Section 10 - Protection of the Public and of Work and Property

The Contractor is responsible for the means, methods, sequences, techniques and procedures of construction and safety programs associated with the work contemplated by this contract. The Contractor, its agents or sub-contractors, shall comply with the "General Rules and Regulations for the Construction Industry" as published by the Construction Safety Commission of the State of Michigan and to all other local, State and National laws, ordinances, rules and regulations pertaining to safety of persons and property.

The Contractor shall take all necessary and reasonable precautions to protect the safety of the public. It shall continuously maintain adequate protection of all work from damage, and shall take all necessary and reasonable precautions to adequately protect all public and private property from injury or loss arising in connection with this Contract. It shall make good any damage, injury or loss to its work and to public and private property resulting from lack of reasonable protective precautions, except as may be due to errors in the contract documents, or caused by agents or

employees of the City. The Contractor shall obtain and maintain sufficient insurance to cover damage to any City property at the site by any cause.

In an emergency affecting the safety of life, or the work, or of adjoining property, the Contractor is, without special instructions or authorization from the Supervising Professional, permitted to act at its discretion to prevent the threatened loss or injury. It shall also so act, without appeal, if authorized or instructed by the Supervising Professional.

Any compensation claimed by the Contractor for emergency work shall be determined by agreement or in accordance with the terms of Claims for Extra Cost - Section 15.

Section 11 - Inspection of Work

The City shall provide sufficient competent personnel for the inspection of the work.

The Supervising Professional shall at all times have access to the work whenever it is in preparation or progress, and the Contractor shall provide proper facilities for access and for inspection.

If the specifications, the Supervising Professional's instructions, laws, ordinances, or any public authority require any work to be specially tested or approved, the Contractor shall give the Supervising Professional timely notice of its readiness for inspection, and if the inspection is by an authority other than the Supervising Professional, of the date fixed for the inspection. Inspections by the Supervising Professional shall be made promptly, and where practicable at the source of supply. If any work should be covered up without approval or consent of the Supervising Professional, it must, if required by the Supervising Professional, be uncovered for examination and properly restored at the Contractor's expense.

Re-examination of any work may be ordered by the Supervising Professional, and, if so ordered, the work must be uncovered by the Contractor. If the work is found to be in accordance with the contract documents, the City shall pay the cost of re-examination and replacement. If the work is not in accordance with the contract documents, the Contractor shall pay the cost.

Section 12 - Superintendence

The Contractor shall keep on the work site, during its progress, a competent superintendent and any necessary assistants, all satisfactory to the Supervising Professional. The superintendent will be responsible to perform all on-site project management for the Contractor. The superintendent shall be experienced in the work required for this Contract. The superintendent shall represent the Contractor and all direction given to the superintendent shall be binding as if given to the Contractor. Important directions shall immediately be confirmed in writing to the Contractor. Other directions will be confirmed on written request. The Contractor shall give efficient superintendence to the work, using its best skill and attention.

Section 13 - Changes in the Work

The City may make changes to the quantities of work within the general scope of the Contract at any time by a written order and without notice to the sureties. If the changes add to or deduct from the extent of the work, the Contract Sum shall be adjusted accordingly. All the changes shall be

executed under the conditions of the original Contract except that any claim for extension of time caused by the change shall be adjusted at the time of ordering the change.

In giving instructions, the Supervising Professional shall have authority to make minor changes in the work not involving extra cost and not inconsistent with the purposes of the work, but otherwise, except in an emergency endangering life or property, no extra work or change shall be made unless in pursuance of a written order by the Supervising Professional, and no claim for an addition to the Contract Sum shall be valid unless the additional work was ordered in writing.

The Contractor shall proceed with the work as changed and the value of the work shall be determined as provided in Claims for Extra Cost - Section 15.

Section 14 - Extension of Time

Extension of time stipulated in the Contract for completion of the work will be made if and as the Supervising Professional may deem proper under any of the following circumstances:

(1) When work under an extra work order is added to the work under this Contract;

(2) When the work is suspended as provided in Section 20;

(3) When the work of the Contractor is delayed on account of conditions which could not have been foreseen, or which were beyond the control of the Contractor, and which were not the result of its fault or negligence;

(4) Delays in the progress of the work caused by any act or neglect of the City or of its employees or by other Contractors employed by the City;

(5) Delay due to an act of Government;

(6) Delay by the Supervising Professional in the furnishing of plans and necessary information;

(7) Other cause which in the opinion of the Supervising Professional entitles the Contractor to an extension of time.

The Contractor shall notify the Supervising Professional within 7 days of an occurrence or conditions which, in the Contractor's opinion, entitle it to an extension of time. The notice shall be in writing and submitted in ample time to permit full investigation and evaluation of the Contractor's claim. The Supervising Professional shall acknowledge receipt of the Contractor's notice within 7 days of its receipt. Failure to timely provide the written notice shall constitute a waiver by the Contractor of any claim.

In situations where an extension of time in contract completion is appropriate under this or any other section of the contract, the Contractor understands and agrees that the only available adjustment for events that cause any delays in contract completion shall be extension of the required time for contract completion and that there shall be no adjustments in the money due the Contractor on account of the delay.

Section 15 - Claims for Extra Cost

If the Contractor claims that any instructions by drawings or other media issued after the date of the Contract involved extra cost under this Contract, it shall give the Supervising Professional written notice within 7 days after the receipt of the instructions, and in any event before proceeding to execute the work, except in emergency endangering life or property. The procedure shall then be as provided for Changes in the Work-Section l3. No claim shall be valid unless so made.

If the Supervising Professional orders, in writing, the performance of any work not covered by the contract documents, and for which no item of work is provided in the Contract, and for which no unit price or lump sum basis can be agreed upon, then the extra work shall be done on a Cost-Plus-Percentage basis of payment as follows:

(1) The Contractor shall be reimbursed for all reasonable costs incurred in doing the work, and shall receive an additional payment of 15% of all the reasonable costs to cover both its indirect overhead costs and profit;

(2) The term "Cost" shall cover all payroll charges for employees and supervision required under the specific order, together with all worker's compensation, Social Security, pension and retirement allowances and social insurance, or other regular payroll charges on same; the cost of all material and supplies required of either temporary or permanent character; rental of all power-driven equipment at agreed upon rates, together with cost of fuel and supply charges for the equipment; and any costs incurred by the Contractor as a direct result of executing the order, if approved by the Supervising Professional;

(3) If the extra is performed under subcontract, the subcontractor shall be allowed to compute its charges as described above. The Contractor shall be permitted to add an additional charge of 5% percent to that of the subcontractor for the Contractor's supervision and contractual responsibility;

(4) The quantities and items of work done each day shall be submitted to the Supervising Professional in a satisfactory form on the succeeding day, and shall be approved by the Supervising Professional and the Contractor or adjusted at once;

(5) Payments of all charges for work under this Section in any one month shall be made along with normal progress payments. Retainage shall be in accordance with Progress Payments-Section 16.

No additional compensation will be provided for additional equipment, materials, personnel, overtime or special charges required to perform the work within the time requirements of the Contract.

When extra work is required and no suitable price for machinery and equipment can be determined in accordance with this Section, the hourly rate paid shall be 1/40 of the basic weekly rate listed in the Rental Rate Blue Book published by Dataquest Incorporated and applicable to the time period the equipment was first used for the extra work. The hourly rate will be deemed to include all costs of operation such as bucket or blade, fuel, maintenance, "regional factors", insurance, taxes, and the like, but not the costs of the operator.

Section 16 - Progress Payments

The Contractor shall submit each month, or at longer intervals, if it so desires, an invoice covering work performed for which it believes payment, under the Contract terms, is due. The submission shall be to the City's Finance Department - Accounting Division. The Supervising Professional will, within 10 days following submission of the invoice, prepare a certificate for payment for the work in an amount to be determined by the Supervising Professional as fairly representing the acceptable work performed during the period covered by the Contractor's invoice. To insure the proper performance of this Contract, the City will retain a percentage of the estimate in accordance with Act 524, Public Acts of 1980. The City will then, following the receipt of the Supervising Professional's Certificate, make payment to the Contractor as soon as feasible, which is anticipated will be within 15 days.

An allowance may be made in progress payments if substantial quantities of permanent material have been delivered to the site but not incorporated in the completed work if the Contractor, in the opinion of the Supervising Professional, is diligently pursuing the work under this Contract. Such materials shall be properly stored and adequately protected. Allowance in the estimate shall be at the invoice price value of the items. Notwithstanding any payment of any allowance, all risk of loss due to vandalism or any damages to the stored materials remains with the Contractor.

In the case of Contracts which include only the Furnishing and Delivering of Equipment, the payments shall be; 60% of the Contract Sum upon the delivery of all equipment to be furnished, or in the case of delivery of a usable portion of the equipment in advance of the total equipment delivery, 60% of the estimated value of the portion of the equipment may be paid upon its delivery in advance of the time of the remainder of the equipment to be furnished; 30% of the Contract Sum upon completion of erection of all equipment furnished, but not later than 60 days after the date of delivery of all of the equipment to be furnished; and payment of the final 10% on final completion of erection, testing and acceptance of all the equipment to be furnished; but not later than l80 days after the date of delivery of all of the equipment to be furnished, unless testing has been completed and shows the equipment to be unacceptable.

With each invoice for periodic payment, the Contractor shall enclose a Contractor's Declaration - Section 43, and an updated project schedule per Order of Completion - Section 2.

Section 17 - Deductions for Uncorrected Work

If the Supervising Professional decides it is inexpedient to correct work that has been damaged or that was not done in accordance with the Contract, an equitable deduction from the Contract price shall be made.

Section 18 - Correction of Work Before Final Payment

The Contractor shall promptly remove from the premises all materials condemned by the Supervising Professional as failing to meet Contract requirements, whether incorporated in the work or not, and the Contractor shall promptly replace and re-execute the work in accordance with the Contract and without expense to the City and shall bear the expense of making good all work of other contractors destroyed or damaged by the removal or replacement.

If the Contractor does not remove the condemned work and materials within l0 days after written notice, the City may remove them and, if the removed material has value, may store the material

at the expense of the Contractor. If the Contractor does not pay the expense of the removal within 10 days thereafter, the City may, upon 10 days written notice, sell the removed materials at auction or private sale and shall pay to the Contractor the net proceeds, after deducting all costs and expenses that should have been borne by the Contractor. If the removed material has no value, the Contractor must pay the City the expenses for disposal within 10 days of invoice for the disposal costs.

The inspection or lack of inspection of any material or work pertaining to this Contract shall not relieve the Contractor of its obligation to fulfill this Contract and defective work shall be made good. Unsuitable materials may be rejected by the Supervising Professional notwithstanding that the work and materials have been previously overlooked by the Supervising Professional and accepted or estimated for payment or paid for. If the work or any part shall be found defective at any time before the final acceptance of the whole work, the Contractor shall forthwith make good the defect in a manner satisfactory to the Supervising Professional. The judgment and the decision of the Supervising Professional as to whether the materials supplied and the work done under this Contract comply with the requirements of the Contract shall be conclusive and final.

Section 19 - Acceptance and Final Payment

Upon receipt of written notice that the work is ready for final inspection and acceptance, the Supervising Professional will promptly make the inspection. When the Supervising Professional finds the work acceptable under the Contract and the Contract fully performed, the Supervising Professional will promptly sign and issue a final certificate stating that the work required by this Contract has been completed and is accepted by the City under the terms and conditions of the Contract. The entire balance found to be due the Contractor, including the retained percentage, shall be paid to the Contractor by the City within 30 days after the date of the final certificate.

Before issuance of final certificates, the Contractor shall file with the City:

(1) The consent of the surety to payment of the final estimate;
(2) The Contractor's Affidavit in the form required by Section 44.

In case the Affidavit or consent is not furnished, the City may retain out of any amount due the Contractor, sums sufficient to cover all lienable claims.

The making and acceptance of the final payment shall constitute a waiver of all claims by the City except those arising from:

(1) unsettled liens;
(2) faulty work appearing within 12 months after final payment;
(3) hidden defects in meeting the requirements of the plans and specifications;
(4) manufacturer's guarantees.

It shall also constitute a waiver of all claims by the Contractor, except those previously made and still unsettled.

Section 20 - Suspension of Work

The City may at any time suspend the work, or any part by giving 5 days notice to the Contractor in writing. The work shall be resumed by the Contractor within 10 days after the date fixed in the

written notice from the City to the Contractor to do so. The City shall reimburse the Contractor for expense incurred by the Contractor in connection with the work under this Contract as a result of the suspension.

If the work, or any part, shall be stopped by the notice in writing, and if the City does not give notice in writing to the Contractor to resume work at a date within 90 days of the date fixed in the written notice to suspend, then the Contractor may abandon that portion of the work suspended and will be entitled to the estimates and payments for all work done on the portions abandoned, if any, plus 10% of the value of the work abandoned, to compensate for loss of overhead, plant expense, and anticipated profit.

Section 21 - Delays and the City's Right to Terminate Contract

If the Contractor refuses or fails to prosecute the work, or any separate part of it, with the diligence required to insure completion, ready for operation, within the allowable number of consecutive calendar days specified plus extensions, or fails to complete the work within the required time, the City may, by written notice to the Contractor, terminate its right to proceed with the work or any part of the work as to which there has been delay. After providing the notice the City may take over the work and prosecute it to completion, by contract or otherwise, and the Contractor and its sureties shall be liable to the City for any excess cost to the City. If the Contractor's right to proceed is terminated, the City may take possession of and utilize in completing the work, any materials, appliances and plant as may be on the site of the work and useful for completing the work. The right of the Contractor to proceed shall not be terminated or the Contractor charged with liquidated damages where an extension of time is granted under Extension of Time - Section 14.

If the Contractor is adjudged a bankrupt, or if it makes a general assignment for the benefit of creditors, or if a receiver is appointed on account of its insolvency, or if it persistently or repeatedly refuses or fails except in cases for which extension of time is provided, to supply enough properly skilled workers or proper materials, or if it fails to make prompt payments to subcontractors or for material or labor, or persistently disregards laws, ordinances or the instructions of the Supervising Professional, or otherwise is guilty of a substantial violation of any provision of the Contract, then the City, upon the certificate of the Supervising Professional that sufficient cause exists to justify such action, may, without prejudice to any other right or remedy and after giving the Contractor 3 days written notice, terminate this Contract. The City may then take possession of the premises and of all materials, tools and appliances thereon and without prejudice to any other remedy it may have, make good the deficiencies or finish the work by whatever method it may deem expedient, and deduct the cost from the payment due the Contractor. The Contractor shall not be entitled to receive any further payment until the work is finished. If the expense of finishing the work, including compensation for additional managerial and administrative services exceeds the unpaid balance of the Contract Sum, the Contractor and its surety are liable to the City for any excess cost incurred. The expense incurred by the City, and the damage incurred through the Contractor's default, shall be certified by the Supervising Professional.

Section 22 - Contractor's Right to Terminate Contract

If the work should be stopped under an order of any court, or other public authority, for a period of 3 months, through no act or fault of the Contractor or of anyone employed by it, then the Contractor may, upon 7 days written notice to the City, terminate this Contract and recover from the City payment for all acceptable work executed plus reasonable profit.

Section 23 - City's Right To Do Work

If the Contractor should neglect to prosecute the work properly or fail to perform any provision of this Contract, the City, 3 days after giving written notice to the Contractor and its surety may, without prejudice to any other remedy the City may have, make good the deficiencies and may deduct the cost from the payment due to the Contractor.

Section 24 - Removal of Equipment and Supplies

In case of termination of this Contract before completion, from any or no cause, the Contractor, if notified to do so by the City, shall promptly remove any part or all of its equipment and supplies from the property of the City, failing which the City shall have the right to remove the equipment and supplies at the expense of the Contractor.

The removed equipment and supplies may be stored by the City and, if all costs of removal and storage are not paid by the Contractor within 10 days of invoicing, the City upon 10 days written notice may sell the equipment and supplies at auction or private sale, and shall pay the Contractor the net proceeds after deducting all costs and expenses that should have been borne by the Contractor and after deducting all amounts claimed due by any lien holder of the equipment or supplies.

Section 25 - Responsibility for Work and Warranties

The Contractor assumes full responsibility for any and all materials and equipment used in the construction of the work and may not make claims against the City for damages to materials and equipment from any cause except negligence or willful act of the City. Until its final acceptance, the Contractor shall be responsible for damage to or destruction of the project (except for any part covered by Partial Completion and Acceptance - Section 26). The Contractor shall make good all work damaged or destroyed before acceptance. All risk of loss remains with the Contractor until final acceptance of the work (Section 19) or partial acceptance (Section 26). The Contractor is advised to investigate obtaining its own builders risk insurance.

The Contractor shall guarantee the quality of the work for a period of one year. The Contractor shall also unconditionally guarantee the quality of all equipment and materials that are furnished and installed under the contract for a period of one year. At the end of one year after the Contractor's receipt of final payment, the complete work, including equipment and materials furnished and installed under the contract, shall be inspected by the Contractor and the Supervising Professional. Any defects shall be corrected by the Contractor at its expense as soon as practicable but in all cases within 60 days. Any defects that are identified prior to the end of one year shall also be inspected by the Contractor and the Supervising Professional and shall be corrected by the Contractor at its expense as soon as practicable but in all cases within 60 days. The Contractor shall assign all manufacturer or material supplier warranties to the City prior to final payment. The assignment shall not relieve the Contractor of its obligations under this paragraph to correct defects.

Section 26 - Partial Completion and Acceptance

If at any time prior to the issuance of the final certificate referred to in Acceptance and Final Payment - Section 19, any portion of the permanent construction has been satisfactorily completed, and if the Supervising Professional determines that portion of the permanent construction is not required for the operations of the Contractor but is needed by the City, the Supervising Professional shall issue to the Contractor a certificate of partial completion, and immediately the City may take over and use the portion of the permanent construction described in the certificate, and exclude the Contractor from that portion.

The issuance of a certificate of partial completion shall not constitute an extension of the Contractor's time to complete the portion of the permanent construction to which it relates if the Contractor has failed to complete it in accordance with the terms of this Contract. The issuance of the certificate shall not release the Contractor or its sureties from any obligations under this Contract including bonds.

If prior use increases the cost of, or delays the work, the Contractor shall be entitled to extra compensation, or extension of time, or both, as the Supervising Professional may determine.

Section 27 - Payments Withheld Prior to Final Acceptance of Work

The City may withhold or, on account of subsequently discovered evidence, nullify the whole or part of any certificate to the extent reasonably appropriate to protect the City from loss on account of:

(1) Defective work not remedied;

(2) Claims filed or reasonable evidence indicating probable filing of claims by other parties against the Contractor;

(3) Failure of the Contractor to make payments properly to subcontractors or for material or labor;

(4) Damage to another Contractor.

When the above grounds are removed or the Contractor provides a Surety Bond satisfactory to the City which will protect the City in the amount withheld, payment shall be made for amounts withheld under this section.

Section 28 - Contractor's Insurance

(1) The Contractor shall procure and maintain during the life of this Contract, including the guarantee period and during any warranty work, such insurance policies, including those set forth below, as will protect itself and the City from all claims for bodily injuries, death or property damage that may arise under this Contract; whether the act(s) or omission(s) giving rise to the claim were made by the Contractor, any subcontractor, or anyone employed by them directly or indirectly. Prior to commencement of any work under this contract, Contractor shall provide to the City documentation satisfactory to the City, through City-approved means (currently myCOI), demonstrating it has obtained the required policies and endorsements. The certificates of insurance endorsements and/or copies of

policy language shall document that the Contractor satisfies the following minimum requirements. Contractor shall add registration@mycoitracking.com to its safe sender's list so that it will receive necessary communication from myCOI. When requested, Contractor shall provide the same documentation for its subcontractor(s) (if any).

Required insurance policies include:

(a) Worker's Compensation Insurance in accordance with all applicable state and federal statutes. Further, Employers Liability Coverage shall be obtained in the following minimum amounts:

Bodily Injury by Accident - $500,000 each accident
Bodily Injury by Disease - $500,000 each employee
Bodily Injury by Disease - $500,000 each policy limit

(b) Commercial General Liability Insurance equivalent to, as a minimum, Insurance Services Office form CG 00 01 04 13 or current equivalent. The City of Ann Arbor shall be named as an additional insured. There shall be no added exclusions or limiting endorsements specifically for the following coverages: Products and Completed Operations, Explosion, Collapse and Underground coverage or Pollution. Further there shall be no added exclusions or limiting endorsements that diminish the City's protections as an additional insured under the policy. The following minimum limits of liability are required:

$1,000,000	Each occurrence as respect Bodily Injury Liability or Property Damage Liability, or both combined.
$2,000,000	Per Project General Aggregate
$1,000,000	Personal and Advertising Injury
$2,000,000	Products and Completed Operations Aggregate, which, notwithstanding anything to the contrary herein, shall be maintained for three years from the date the Project is completed.

(c) Motor Vehicle Liability Insurance, including Michigan No-Fault Coverages, equivalent to, as a minimum, Insurance Services Office form CA 00 01 10 13 or current equivalent. Coverage shall include all owned vehicles, all non-owned vehicles and all hired vehicles. The **City of Ann Arbor and the Regents of the University of Michigan** shall be named as additional insured. There shall be no added exclusions or limiting endorsements that diminish the City's protections as an additional insured under the policy. Further, the limits of liability shall be $1,000,000 for each occurrence as respects Bodily Injury Liability or Property Damage Liability, or both combined.

(d) Umbrella/Excess Liability Insurance shall be provided to apply excess of the Commercial General Liability, Employers Liability and the Motor Vehicle coverage enumerated above, for each occurrence and for aggregate in the amount of $1,000,000.

(2) Insurance required under subsection (1)(b) and (1)(c) above shall be considered primary as respects any other valid or collectible insurance that the City may possess, including any self-insured retentions the City may have; and any other insurance the City does possess shall be considered excess insurance only and shall not be required to contribute

with this insurance. Further, the Contractor agrees to waive any right of recovery by its insurer against the City for any insurance listed herein.

(3) Insurance companies and policy forms are subject to approval of the City Attorney, which approval shall not be unreasonably withheld. Documentation must provide and demonstrate an unconditional and un-qualified 30-day written notice of cancellation in favor of the City of Ann Arbor. Further, the documentation must explicitly state the following: (a) the policy number(s); name of insurance company(s); name and address of the agent(s) or authorized representative(s); name(s), email address(es), and address of insured; project name; policy expiration date; and specific coverage amounts; (b) any deductibles or self-insured retentions which may be approved by the City, in its sole discretion; (c) that the policy conforms to the requirements specified Contractor shall furnish the City with satisfactory certificates of insurance and endorsements prior to commencement of any work. Upon request, the Contractor shall provide within 30 days a copy of the policy(ies) and all required endorsements to the City. If any of the above coverages expire by their terms during the term of this Contract, the Contractor shall deliver proof of renewal and/or new policies and endorsements to the Administering Service Area/Unit at least ten days prior to the expiration date.

(4) Any Insurance provider of Contractor shall be authorized to do business in the State of Michigan and shall carry and maintain a minimum rating assigned by A.M. Best & Company's Key Rating Guide of "A-" Overall and a minimum Financial Size Category of "V". Insurance policies and certificates issued by non-authorized insurance companies are not acceptable unless approved in writing by the City.

(5) City reserves the right to require additional coverage and/or coverage amounts as may be included from time to time in the Detailed Specifications for the Project.

(6) The provisions of General Condition 28 shall survive the expiration or earlier termination of this contract for any reason.

Section 29 - Surety Bonds

Bonds will be required from the successful bidder as follows:

(1) A Performance Bond to the City of Ann Arbor for the amount of the bid(s) accepted;
(2) A Labor and Material Bond to the City of Ann Arbor for the amount of the bid(s) accepted.

Bonds shall be executed on forms supplied by the City in a manner and by a Surety Company authorized to transact business in Michigan and satisfactory to the City Attorney.

Section 30 - Damage Claims

The Contractor shall be held responsible for all damages to property of the City or others, caused by or resulting from the negligence of the Contractor, its employees, or agents during the progress of or connected with the prosecution of the work, whether within the limits of the work or elsewhere. The Contractor must restore all property injured including sidewalks, curbing, sodding, pipes, conduit, sewers or other public or private property to not less than its original condition with new work.

Section 31 - Refusal to Obey Instructions

If the Contractor refuses to obey the instructions of the Supervising Professional, the Supervising Professional shall withdraw inspection from the work, and no payments will be made for work performed thereafter nor may work be performed thereafter until the Supervising Professional shall have again authorized the work to proceed.

Section 32 - Assignment

Neither party to the Contract shall assign the Contract without the written consent of the other. The Contractor may assign any monies due to it to a third party acceptable to the City.

Section 33 - Rights of Various Interests

Whenever work being done by the City's forces or by other contractors is contiguous to work covered by this Contract, the respective rights of the various interests involved shall be established by the Supervising Professional, to secure the completion of the various portions of the work in general harmony.

The Contractor is responsible to coordinate all aspects of the work, including coordination of, and with, utility companies and other contractors whose work impacts this project.

Section 34 - Subcontracts

The Contractor shall not award any work to any subcontractor without prior written approval of the City. The approval will not be given until the Contractor submits to the City a written statement concerning the proposed award to the subcontractor. The statement shall contain all information the City may require.

The Contractor shall be as fully responsible to the City for the acts and omissions of its subcontractors, and of persons either directly or indirectly employed by them, as it is for the acts and omissions of persons directly employed by it.

The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bind subcontractors to the Contractor by the terms of the General Conditions and all other contract documents applicable to the work of the subcontractors and to give the Contractor the same power to terminate any subcontract that the City may exercise over the Contractor under any provision of the contract documents.

Nothing contained in the contract documents shall create any contractual relation between any subcontractor and the City.

Section 35 - Supervising Professional's Status

The Supervising Professional has the right to inspect any or all work. The Supervising Professional has authority to stop the work whenever stoppage may be appropriate to insure the proper execution of the Contract. The Supervising Professional has the authority to reject all work and materials which do not conform to the Contract and to decide questions which arise in the execution of the work.

The Supervising Professional shall make all measurements and determinations of quantities. Those measurements and determinations are final and conclusive between the parties.

Section 36 - Supervising Professional's Decisions

The Supervising Professional shall, within a reasonable time after their presentation to the Supervising Professional, make decisions in writing on all claims of the City or the Contractor and on all other matters relating to the execution and progress of the work or the interpretation of the contract documents.

Section 37 - Storing Materials and Supplies

Materials and supplies may be stored at the site of the work at locations agreeable to the City unless specific exception is listed elsewhere in these documents. Ample way for foot traffic and drainage must be provided, and gutters must, at all times, be kept free from obstruction. Traffic on streets shall be interfered with as little as possible. The Contractor may not enter or occupy with agents, employees, tools, or material any private property without first obtaining written permission from its owner. A copy of the permission shall be furnished to the Supervising Professional.

Section 38 - Lands for Work

The Contractor shall provide, at its own expense and without liability to the City, any additional land and access that may be required for temporary construction facilities or for storage of materials.

Section 39 - Cleaning Up

The Contractor shall, as directed by the Supervising Professional, remove at its own expense from the City's property and from all public and private property all temporary structures, rubbish and waste materials resulting from its operations unless otherwise specifically approved, in writing, by the Supervising Professional.

Section 40 - Salvage

The Supervising Professional may designate for salvage any materials from existing structures or underground services. Materials so designated remain City property and shall be transported or stored at a location as the Supervising Professional may direct.

Section 41 - Night, Saturday or Sunday Work

No night or Sunday work (without prior written City approval) will be permitted except in the case of an emergency and then only to the extent absolutely necessary. The City may allow night work which, in the opinion of the Supervising Professional, can be satisfactorily performed at night. Night work is any work between 8:00 p.m. and 7:00 a.m. No Saturday work will be permitted unless the Contractor gives the Supervising Professional at least 48 hours but not more than 5 days notice of the Contractor's intention to work the upcoming Saturday.

Section 42 - Sales Taxes

Under State law the City is exempt from the assessment of State Sales Tax on its direct purchases. Contractors who acquire materials, equipment, supplies, etc. for incorporation in City projects are not likewise exempt. State Law shall prevail. The Bidder shall familiarize itself with the State Law and prepare its Bid accordingly. No extra payment will be allowed under this Contract for failure of the Contractor to make proper allowance in this bid for taxes it must pay.

Section 43

CONTRACTOR'S DECLARATION

I hereby declare that I have not, during the period _____, 20___, to _____, 20 , performed any work, furnished any materials, sustained any loss, damage or delay, or otherwise done anything in addition to the regular items (or executed change orders) set forth in the Contract titled _____, for which I shall ask, demand, sue for, or claim compensation or extension of time from the City, except as I hereby make claim for additional compensation or extension of time as set forth on the attached itemized statement. I further declare that I have paid all payroll obligations related to this Contract that have become due during the above period and that all invoices related to this Contract received more than 30 days prior to this declaration have been paid in full except as listed below.

There is/is not (Contractor please circle one and strike one as appropriate) an itemized statement attached regarding a request for additional compensation or extension of time.

_____ _____
Contractor Date

By _____
(Signature)

Its _____
(Title of Office)

Past due invoices, if any, are listed below.

Section 44

CONTRACTOR'S AFFIDAVIT

The undersigned Contractor,_____, represents that on _____, 20___, it was awarded a contract by the City of Ann Arbor, Michigan to_____ under the terms and conditions of a Contract titled _____. The Contractor represents that all work has now been accomplished and the Contract is complete.

The Contractor warrants and certifies that all of its indebtedness arising by reason of the Contract has been fully paid or satisfactorily secured; and that all claims from subcontractors and others for labor and material used in accomplishing the project, as well as all other claims arising from the performance of the Contract, have been fully paid or satisfactorily settled. The Contractor agrees that, if any claim should hereafter arise, it shall assume responsibility for it immediately upon request to do so by the City of Ann Arbor.

The Contractor, for valuable consideration received, does further waive, release and relinquish any and all claims or right of lien which the Contractor now has or may acquire upon the subject premises for labor and material used in the project owned by the City of Ann Arbor.

This affidavit is freely and voluntarily given with full knowledge of the facts.

_____ _____
Contractor Date

By _____
(Signature)

Its _____
(Title of Office)

Subscribed and sworn to before me, on this _____ day of _____, 20__
_____ , _____ County, Michigan
Notary Public
_____ County, MI
My commission expires on:

STANDARD SPECIFICATIONS

All work under this contract shall be performed in accordance with the Public Services Department Standard Specifications in effect at the date of availability of the contract documents stipulated in the Bid. All work under this Contract which is not included in these Standard Specifications, or which is performed using modifications to these Standard Specifications, shall be performed in accordance with the Detailed Specifications included in these contract documents.

Standard Specifications are available online:

http://www.a2gov.org/departments/engineering/Pages/Engineering-and-Contractor-Resources.aspx

DETAILED SPECIFICATIONS

CITY OF ANN ARBOR

DETAILED SPECIFICATIONS

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DETAILED SPECIFICATION **FOR**
COORDINATION AND COOPERATION WITH OTHERS AND WORK BY OTHERS

NOTE: This project is being completed under a cooperative arrangement between the City of Ann Arbor (City) and the University of Michigan (UM). The contract holder will be the City of Ann Arbor. References to either entity, whether mentioned singularly or together, shall be considered to include both entities in their role as co-sponsors of the project. Under this arrangement, both the City and the UM have assigned project engineers to manage the project; therefore, references in these construction documents to "Engineer" shall be assumed to mean both engineer managers.

The Contractor is reminded as to the requirements of article 104.08 of the 2020 edition of the MDOT Standard Specifications, "Cooperation by the Contractor."

The Contractor shall directly coordinate his/her work with the City of Ann Arbor, the University of Michigan and any other utilities that are affected in this area and that will be working in the area during Project construction. A table detailing some of the coordination for utility relocation installation that will be needed is included below. This list is not a complete detail of all the project coordination work. It is intended to indicate major utility coordination and assist the Contractor in developing, for the review and approval of the Engineer, the Progress Schedule for the project.

No additional compensation will be paid to the Contractor, and no adjustments to contract unit prices will be made, due to delays and/or the failure of others in the performance of their work, nor for delays due to the encountering of existing utilities that are, or are not, shown on the Plans.

The following Utility Owners may have overhead and/or underground facilities located within the Right-of-Way:

The City of Ann Arbor		
Travis Conley	Sanitary	(734) 277-2090
Tracy Pennington	Streets	(734) 355-7233
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EMCD Bridge Conduits

	Conduit	Number	Function	Owner	Existing Location	Relocator before bridge construction	Temporary Relocation	Timeframe	Note
Existing	3" Dia.	1	Street Lights	UM	Sidewalk (both sides)	NA			
	4" Dia.	12	Communication	ATT	Sidewalk (east side)				
	7" Dia.	6	Communication	UM	Sidewalk (west side)	UM	N.S. Fuller Rd.	Prior to Construction	
	7" Dia.	3	Communication	UM	Sidewalk (east side)	UM		Prior to Phase 3, once SIP forms are placed for deck	
	4" Dia.	1	Traffic Signals	City	Sidewalk (west side)	City of Ann Arbor Signs and Signals	wireless antennas installed by Signs and Signals	Contractor needs to give 1 week notice before bridge construction	

	Conduit	Number	Function	Owner	Permanent Relocation	Relocator during bridge construction	Temporary Relocation	Timeframe	Note
Proposed	3" Dia.	1	Street Lights	City	Sidewalk (west side)	Contractor	NA	After Phase 2	
	3" Dia.	1	Street Lights	City	Sidewalk (east side)	Contractor	NA	After Phase 3	
	2" Dia.	1	Hospital Signs	UM	Sidewalk (west side)	Contractor	NA	After Phase 2	
	4" Dia.	12	Communication	ATT	Under Bridge (2nd bay from West fascia)	ATT	NA	Prior to Phase 3, once SIP forms are placed for deck. ATT needs 6 weeks to complete their work.	ATT to install permanent conduit north and south of bridge prior to construction
	4" Dia.	6	Communication	UM	Under Bridge (1st Bay from West fascia)	UM	NA	Post Construction	
	4" Dia.	1	Traffic Signals	City	Under Bridge (1st Bay from West Fascia)	Contractor	NA	Post Construction	City of Ann Arbor Signs and Signals need to be notified to install fiber once its complete

On all projects:

“3 Working Days before you Dig - Call MISS DIG - Toll Free” Phone No. 1-800-482-7171.

The Owners of public or private utilities which will not interfere with the completed project and which do not present a hazard to the public or an extraordinary hazard to the Contractor's operations will not be required to move their facilities on or from the street right-of-way.

Stoppages created solely by the operations of the utility companies which delay utility revisions on any portion of this project may be considered as a basis of claim for an extension of time for project completion.

Costs for this work will not be paid for separately, but shall be included in the bid price of the Contract Item “General Conditions.”

DETAILED SPECIFICATION FOR
DISPOSING OF EXCAVATED MATERIAL

The Contractor shall dispose of, at the Contractor's expense, all excavated material other than the Special Provision "Relocation and Site Cleanup" pay item. Costs for this work will not be paid for separately, but shall be included in the bid price of the Contract Item "General Conditions."

DETAILED SPECIFICATION FOR
PROTECTION OF UTILITIES

Damages to utilities by the Contractor's operations shall be repaired by the utility owner at the Contractor's expense.

Delays to the work due to utility repairs are the sole responsibility of the Contractor.

The Contractor shall keep construction debris out of utilities at all times. The Contractor shall be back charged an amount of $50.00 per day for each manhole/inlet/utility pipe that contains construction debris caused as a result of the Contractor's (including subcontractors and suppliers) work.

The Contractor is solely responsible for any damages to the utilities or abutting properties due to construction debris.

Certain sanitary and storm sewers within the influence of construction may have been cleaned and videotaped prior to construction. The City may also choose to videotape utility line(s) during or after the work of this Contract to inspect them for damages and/or construction debris. If such inspection shows damage and/or debris, then all costs of such inspection, cleaning, repairs, and etc, shall be the Contractor's sole responsibility. If such inspection is negative, the City will be responsible for the costs of such inspection.

Costs for this work will not be paid for separately, but shall be included in the bid price of the Contract Item "General Conditions."

DETAILED SPECIFICATION FOR
SOIL EROSION CONTROL

The Contractor shall maintain and remove soil erosion and sedimentation control measures, including but not limited to, fabric filters at all drainage structures, all in accordance with all applicable City (and other governmental agencies) codes and standards, as directed by the Engineer, Supervising Professional, as detailed in the Standard Specifications, and as shown on the Plans.

Costs for this work will not be paid for separately, but shall be included in the bid price of the Contract Item "General Conditions."

DETAILED SPECIFICATION FOR
VACUUM TYPE STREET AND UTILITY STRUCTURE CLEANING EQUIPMENT

The Contractor shall furnish and operate throughout the construction period, vacuum type street cleaning and utility structure cleaning equipment (Vac-All, Vactor, etc.) approved by the Engineer, as and when directed by the Engineer for dust control, for dirt/debris control, and for street cleaning immediately prior to, and for street and utility structure cleaning after any and all paving. The cleaning equipment shall be of sufficient power to remove dust, dirt, and debris from the pavement and from utility structures in and adjacent to the construction area.

Costs for this work will not be paid for separately, but shall be included in the bid price of the Contract Item "General Conditions."

DETAILED SPECIFICATION FOR
SITE CLEAN-UP

Immediately after completion of construction on each phase, the Contractor shall clean the entire area within the influence of construction, including but not limited to all pavement, sidewalks, lawn areas, and underground utility structures, of all materials which may have accumulated prior to or during the construction.

Costs for this work will not be paid for separately, but shall be included in the bid price of the Contract Item "General Conditions."

DETAILED SPECIFICATION FOR
MATERIALS AND SUPPLIES CERTIFICATIONS

The following materials and supplies shall be certified by the manufacturer or supplier as having been tested for compliance with the Specifications:

HMA materials
Hot-poured Joint Sealants
Cements, coatings, admixtures and curing materials
Sands and Aggregates
Steel and Fabricated metal
Portland Cement Concrete Mixtures
Reinforcing Steel for Concrete
Precast Concrete products
High Density Polyethylene Pipe
Polyvinyl Chloride Pipe
Steel Sheet Piling for retaining walls
Geotextile Filter Fabric and Stabilization Fabric/Grids

The Contractor shall submit all certifications to the Engineer for review and approval a minimum of three business days prior to any scheduled delivery, installation, and/or construction of same.

Costs for this work will not be paid for separately, but shall be included in the bid price of the Contract Item "General Conditions."

DETAILED SPECIFICATION FOR
CONTRACT DRAWINGS/PLANS

The Contractor shall carefully check and review all Drawings/Plans and advise the Engineer of any errors or omissions discovered. The Drawings/Plans may be supplemented by such additional Drawings/Plans and sketches as may be necessary or desirable as the work progresses. The Contractor shall perform all work shown on any additional or supplemental Drawings/Plans issued by the Engineer.

DETAILED SPECIFICATION FOR
EXISTING
SOIL BORING AND PAVEMENT SECTION DATA

Data pertaining to existing soil borings and pavement sections which may be included in these Contract Documents are provided to help the Engineer and Contractor determine the soil conditions existing within the construction area. The City in no way guarantees existing conditions to be the same as shown in the data. The Contractor is solely responsible for any and all conclusions he/she may draw from the data.

DETAILED SPECIFICATION FOR
WORKING IN THE RAIN

The Contractor shall not work in the rain unless authorized in writing by the Engineer.

The Engineer may delay or stop the work due to threatening weather conditions.

The Contractor shall not be compensated for unused materials or downtime due to rain, or the threat of rain.

The Contractor is solely responsible for repairing all damages to the work and to the site, including road infrastructures, road subgrades, and any adjacent properties, which are caused as a result of working in the rain.

DETAILED SPECIFICATION FOR
WORKING IN THE DARK

The Contractor shall not work in the dark except as approved by the Engineer and only when lighting for night work is provided as detailed elsewhere in this contract. See pay items related to nightwork.

The Engineer may stop the work, or may require the Contractor to defer certain work to another day, if, in the Engineer's opinion, the work cannot be completed within the remaining daylight hours, or if inadequate daylight is present to either properly perform or inspect the work.

The Contractor will not be compensated for unused materials or downtime, when delays or work stoppages are directed by the Engineer for darkness and/or inadequate remaining daylight reasons.

The Contractor is solely responsible for repairing all damages to the work and to the site, including road infrastructures, road subgrades, and any adjacent properties, which are caused as a result of working in the dark.

DETAILED SPECIFICATION FOR
QUANTITIES AND UNIT PRICES

Quantities as given are approximate and are estimated for bidding purposes. Quantities are not guaranteed and may vary by any amount. While it is the City of Ann Arbor and the UM's intent to complete the project substantially as drawn and specified herein, quantities may be changed or reduced to zero for cost savings or other reasons. **The City of Ann Arbor and the UM reserve the right to change the quantities and no adjustment in unit price will be made for any change in any quantity.**

DETAILED SPECIFICATION FOR
GENERAL CONSTRUCTION NOTES

The following notes pertain to all Plan sheets issued as part of this Contract, and these notes shall be considered part of each Plan sheet or Detailed Information Sheet.

1. All work shall conform to latest revision of the City Standard Specifications.

2. The Contractor shall maintain access to all drives throughout the course of construction. Drives shall never be closed during non-working hours, unless otherwise authorized in writing by the Engineer.

3. The Contractor shall completely restore all existing site features to better than, or equal to, their existing condition.

4. The Contractor shall be aware that there are above-ground and below-ground utilities existing in and on these streets which include, but are not limited to: gas mains and service leads; water mains and service leads; storm sewer mains and service leads; sanitary sewer mains and service leads; telephone poles, wires, cables and conduits; electrical poles, wires, cables and conduits; cable television wires, cables and conduits, and other various utilities. The Contractor shall conduct all of its work so as not to damage or alter in any way, any existing utility, except where specified on the Plans or where directed by the Engineer. The City has videotaped and cleaned all sanitary and storm sewers, including storm sewer inlet leads, and has found all of these facilities to be in good condition, with the exception of those shown on the Plans for repairs or replacement.

5. The Contractor is solely responsible for any delays, damages, costs and/or charges incurred due to and/or by reason of any utility, structure, feature and/or site condition, whether shown on the Plans or not, and the Contractor shall repair and/or replace, at its sole expense, to as good or better condition, any and all utilities, structures, features and/or site conditions which are impacted by reason of the work, or damaged by its operations, or damaged during the operations of its subcontractors or suppliers.

6. No extra payments or adjustments to unit prices will be made for damages, delays, costs and/or charges due to existing utilities, structures, features and/or site conditions not shown or being incorrectly shown or represented on the Plans.

7. The Contractor is solely responsible for furnishing the appropriate equipment and qualified personnel for the size and condition of the site and the requirements of the proposed work. Damage to buildings, amenities, utilities, paving, and facilities within and adjacent to the work area, and to work already performed by the Contractor shall be the responsibility of the Contractor to repair as needed, at no cost to the project.

DETAILED SPECIFICATION FOR
CONCRETE DURABILITY

DESCRIPTION

The Contractor shall furnish a Portland cement concrete mixture for this project that has been tested under this specification and shown to be resistant to excessive expansion caused by alkali-silica reactivity (ASR) and provides adequate air entrainment for freeze thaw durability. The Contractor shall construct the project with practices outlined in this specification.

MATERIALS

Submit a job mix formula (JMF) to the Engineer for approval prior to concrete work commencing.

The materials provided for use on this project shall conform to the following requirements:

Portland cement	ASTM C 150
Fine Aggregate	ASTM C 33*
Coarse Aggregate	ASTM C 33*
Fly Ash, Class F	ASTM C 618
Slag Cement, Grade 100, 120	ASTM C 989 Silica
Fume	ASTM C 1240
Blended Cements	ASTM C-595
Air Entraining Admixtures	ASTM C-260
Chemical Admixtures	ASTM C-494
White Membrane Cure	ASTM C-309 Type 2

* Fine and coarse aggregates shall consist of natural aggregates as defined in the 2020 MDOT Standard Specifications Section 902.02.A.

The Contractor shall provide documentation that all materials to be incorporated into proposed mixed designs meet the requirements of this section.

Portland Cement

Furnish Type IL Portland cement in accordance with section 901 of the MDOT Standard Specifications for Construction meeting the chemical and physical requirements specified in ASTM C595/C595M, Standard Specifications for Blended Hydraulic Cements. Ensure the Type IL Portland cement proposed for substitution is from the same Approved Manufacturer as the Type I Portland cement in the approved JMF.

At least 7 days prior to concrete production, the concrete producer must provide test data (specified below) generated from a four cubic yard (minimum) trial batch of concrete using Type IL Portland cement for the Engineer's review and approval. The trial batch must represent a current approved JMF for either a standard MDOT Grade 3500, Grade 3500HP, Grade 4500, or Grade 4500HP concrete mixture produced using Type I Portland cement, as described in section 1004 of the Standard Specifications for Construction. Ensure the materials and mixture proportions for the Type IL JMF are the same as those documented in the above-mentioned JMF using Type I Portland cement. Minor adjustments to chemical admixture dosages are permitted in efforts to achieve the specified fresh concrete properties. Trial batch compliance

for applications other than Portland cement concrete mixtures will be in accordance with the contract.

The Engineer will review the trial batch test data to determine if the fresh and hardened concrete properties of the Type IL JMF meet specification requirements for the respective MDOT Grade o concrete represented by the trial batch. If the Engineer determines that the trial batch test data are in conformance with specification requirements, then the Type IL Portland cement will be permitted to be substituted in lieu of the Type I Portland cement for all approved concrete mixtures generated at the concrete production facility for the project. If the Engineer determines that the trial batch test data do not meet specification requirements for the respective MDOT Grade of concrete, the Contractor will not be permitted to substitute Type IL Portland cement in lieu of Type I Portland cement. Mix design and JMF documentation for concrete mixtures using Type IL Portland cement will then be required in accordance with subsection 1003.03.C of the Standard Specifications for Construction or the contract, where applicable.

Once Type IL Portland cement is approved for use on the project, reinstatement of Type I Portland cement into the JMF is not permitted. Substitution of other material types or sources, including admixtures, as documented in the initial Type I JMF is not permitted.

Alkali-Silica Reactivity

The Contractor shall supply to the Engineer preliminary concrete mix designs including a list and location of all suppliers of concrete materials. The Contractor shall evaluate the mixtures for the potential for excessive expansion caused by ASR and provide documentation to the Engineer. The Contractor's evaluation shall include a review of any previous testing of the material sources intended to be used for both the fine and coarse aggregates for the concrete mixtures. The previous testing may be from other projects or records provided by the material suppliers.

Aggregates shall be tested under ASTM C-1260. If the expansion of the mortar bars is less than 0.10%, at 14 days, the aggregates shall be considered innocuous and there are no restrictions for ASR mitigation required with this material.

Previous aggregate test data may be used. If no previous test data is available, for the concrete mix, that shows that it is resistant to ASR, a concrete mixture that will mitigate the potential for ASR must be designed using either method 1 or 2 as described below.

Method 1. Substitution of a portion of the cement with Class F Fly Ash, Slag Cement Grade 100 or 120 or a ternary mix (blended cement) containing a blend of Portland cement and slag cement, or Class F fly ash, or silica fume.

The maximum substitution of cement with the fly ash permitted shall be 25% by weight of total cementitious material (cement plus fly ash). Additional requirements for the Fly Ash, Class F are that the Calcium Oxide (CaO) percent shall be less than 10 % and the available alkalis shall not exceed a maximum of 1.5%. A copy of the most recent mill test report shall be submitted to verify. Note: a Class C fly ash with a minimum total oxides ($SiO_2 + Al_2O_3 + Fe_2O_3$) of 66% and a minimum SiO_2 of 38% may be used in lieu of Type F fly ash.

The maximum substitution of cement with the Slag Cement permitted shall be 40% by weight of total cementitious material (cement plus Slag Cement). The minimum replacement rate with Slag Cement shall be 25%.

For a ternary blend the total replacement of supplementary cementitious materials is 40% with a blend consisting of a maximum of 15% type F fly ash, and/or 8% silica fume and/or slag cement.

For method 1, the effectiveness of the proposed mix combination to resist the potential for excessive expansion caused by ASR shall be demonstrated using current or historic data. To demonstrate the effectiveness of the proposed mix the Contractor shall construct and test mortar bars per ASTM C1567 (14 day test) using both the fine and coarse aggregate along with the proposed cementitious material for the concrete mixture. If a mortar bar constructed of these materials produces an expansion of less than 0.10%, concrete mixture will be considered to be resistant to excessive expansion due to ASR.

If a mortar bar constructed produces an expansion of 0.10% or greater, concrete mixtures containing these materials shall not be considered resistant to the potential for excessive expansion due to ASR and shall be rejected. Additional testing, including alternate proportions or different materials will be required.

Method 2. Use low alkali cement and maintain the total alkali content from the cementitious at no more than 3.0 lbs/cyd (Na2Oeq). The total alkali contribution is calculated by the quantity contained in the Portland cement only.

Requirements for Low Alkali Cement are that the alkali content does not exceed 0.60% expressed as Na2O equivalent. Equivalent sodium oxide is calculated as: (percent Na2O + 0.658 x percent K2O).

For either method 1 or 2, if the Contractor intends to change any component material supplied after the mix design has been approved all concrete work will be suspended with no cost to the project or extensions of time, unless approved, until evaluation of the new mixtures and testing of the new materials demonstrates that it is resistant to excessive expansion due to ASR.

The Engineer and Contractor shall monitor the concrete that is delivered to the project site so as to insure that the approved mix design is being followed. The supplier shall include on the delivery ticket for each batch of concrete delivered to the job, the identification and proportions of each material batched.

When concrete is placed during cold weather, defined for the purposes of this Detailed Specification to be, air temperatures below 40º F, the use of accelerators, heated aggregates, silica fume and/or additional forms of cold weather protection will be required. Cold weather will not eliminate the requirement for furnishing and placing a concrete mix that is considered resistant to ASR attack.
Prior to cool weather placement, defined for the purposes of this detailed specification to be, air temperatures between 40º and 60º F, the set time of the proposed mix shall be verified under anticipated field conditions. This information shall be used when scheduling pours and saw crews.

Air Entrainment

Air entrainment shall be accomplished by addition of an approved air entraining agent. Air content as determined by ASTM C 231 or ASTM C 173, shall be determined on each day of production as early and as frequently as necessary until the air content is consistently acceptable. If during the period of time while adjustments are being made to the concrete to create a mixture that is consistently acceptable, concrete is produced that does not meet the requirements of this Detailed Specification, the Engineer may reject the material and direct it to be removed from the jobsite. Any rejected material shall be removed from the jobsite at the Contractor's sole expense. Quality Control testing performed by the Contractor to ensure compliance with the project specifications shall be performed on the grade ahead of the placement operation.

Paver placement: During production, the plastic concrete material shall be tested for acceptance at a point ahead of the paver. The air content of the concrete mixture that the Contractor shall provide shall be known as the Acceptance Air Content (AAC). The Contractor shall also provide additional entrained air in the concrete mixture to account for the air loss which occurs in the concrete mixture experienced during transportation, consolidation and placement of the concrete. The "air loss" shall be added to the air content of the concrete mixture as established on the approved concrete mix design. The AAC for the project will be 6.0% plus an amount equal to the air loss.

For up to the first four loads, the air content measured on-site prior to placement shall be at least 8.0% and no more than 12.0%. To establish the initial AAC on the first day of paving, the air content of the first load shall be tested at the plant. After initial testing at the plant the Contractor shall provide at least two sample sets to determine the actual air loss during placement. A sample set shall consist of two samples of concrete from the same batch, one taken at the point of discharge and the other from the in-place concrete behind the paver. The air loss from the two sample sets shall be averaged and added to 6.0% to establish the AAC (rounded to the next higher 0.5%). After the testing and adjustment procedure(s) have been completed, the project acceptance air tests shall be taken prior to placement. The Contractor shall provide concrete to the jobsite that has an air content of plus 2.0%, or minus 1.0%, of the AAC.

After the AAC has been established, it shall be verified and/or adjusted through daily checks of the air loss through the paver. The Contractor shall check the air loss through the paver a minimum of two times a day. A Revised AAC shall be required to be established by the Contractor if the average air loss from two consecutive tests deviates by more than 0.5% from the current accepted air loss. The testing operations performed by the Contractor to establish a revised AAC shall be performed to the satisfaction of the Engineer. The Contractor shall be solely responsible for any delays and/or costs that occur to the project while establishing revised AACs.

Hand placed concrete: The air content for non-slip-form paving shall be 7.0% plus 1.5%, or minus 1.0%, at the point of placement.

CONSTRUCTION METHODS

Aggregate Control

Gradation control – The supplier shall provide a detailed stockpile management plan, describing their process control procedure for shipping, handling, and stockpiling of each aggregate including workforce training.

Moisture control – All aggregate materials must be conditioned to a moisture content of not less than saturated surface dry (SSD) prior to batching. A watering process using an effective sprinkler system designed and operated by the Contractor shall be required on all coarse aggregate material stockpiles.

The Contractor shall provide verification that these processes have been performed by the supplier. The Engineer reserves the right to independently verify that the supplier has complied with these standards.

Mixing

Central mix plants - The total volume of the batch shall not exceed the designated size of the mixer or the rated capacity as shown on the manufacturer's rating plate.

Drum Mix Plants: After all solid materials are assembled in the mixer drum; the mixing time shall be a minimum of 60 seconds and a maximum of 5 minutes. The mixing time may be decreased if the ASTM C-94 11.3.3 mixer efficiency tests show that the concrete mixing is satisfactory. The Engineer may require an increase in the minimum mix time if the mixer efficiency test determines that the concrete is not being mixed satisfactorily. The minimum mixing time shall start after the mixer is fully charged. Mixers shall be operated at the speed recommended by the manufacturer as mixing speed. The mixer shall be charged so that a uniform blend of materials reached the mixer throughout the charging cycle. Any additional slump water required shall be added to the mixing chamber by the end of the first 25% of the specified mixing time. Mixers shall not be used if the drum is not clean or if the mixing blades are damaged or badly worn

Ribbon mixers: After all solid materials are assembled in the mixer; the mixing time shall be a minimum of 30 seconds and a maximum of 2.5 minutes. The mixing time may be decreased if the ASTM C-94 11.3.3 mixer efficiency tests show that the concrete mixing is satisfactory. The Engineer may require an increase in the minimum mix time if the mixer efficiency test determines that the concrete is not being mixed satisfactorily. The minimum mixing time shall be indicated by an accurate timing device which is automatically started when the mixer is fully charged. Mixers shall be operated at the speed recommended by the manufacturer as mixing speed. The mixer shall be charged so that a uniform blend of materials reached the mixer throughout the charging cycle. After any additional slump water is added to the mixing chamber the mixing shall continue for a minimum of 10 seconds. Mixers shall not be used if the mixer is not clean or if the mixing blades are damaged or badly worn.

Truck Mixers -The capacities and mixing capabilities shall be as defined in ASTM C 94, and each unit shall have an attached plate containing the information described therein. The plate may be issued by the Truck Mixer Manufacturer. The mixer capacity shall not be exceeded, and the mixing speeds shall be within the designated limits. Truck mixers shall be equipped with a reliable reset revolution counter. If truck mixers are used for mixing while in transit, the revolution counter shall register the number of revolutions at mixing speed.

An authorized representative of the concrete producer shall certify that the interior of the mixer drum is clean and reasonably free of hardened concrete, that the fins or paddles are not broken or worn excessively, that the other parts are in proper working order, and that the unit has been checked by the representative within the previous 30 calendar day period to substantiate this certification. The current, signed certification shall be with the unit at all times.

The required mixing shall be between 70 and 90 revolutions. The mixing shall be at the rate designated by the manufacturer and shall produce uniform, thoroughly mixed concrete.

The Engineer may inspect mixer units at any time to assure compliance with certification requirements, and removal of inspection ports may be required. Should the Engineer question the quality of mixing, the Engineer may check the slump variation within the batch. Should the slump variation between two samples taken, one after approximately 20% discharge and one after approximately 90% discharge of the batch, show a variation greater than 3/4 inch (20 mm) or 25% of the average of the two, whichever is greater, the Engineer may require the mixing to be increased, the batch size reduced, the charging procedure be modified or the unit removed from the work.

The practice of adding water on the site shall be discouraged. After the slump of the concrete in the first round of trucks has been adjusted on-site, the amount of water added at the plant shall be adjusted accordingly for that day's work. All additions of water on site shall be approved by the Engineer.

Curing

Apply liquid curing compound in a fine atomized spray to form a continuous, uniform film on the horizontal surface, vertical edges, curbs and back of curbs immediately after the surface moisture has disappeared, but no later than 30 minutes after concrete placement. With approval of the Engineer, the timing of cure application may be adjusted due to varying weather conditions and concrete mix properties.

The cure system shall be on site and tested prior to concrete placement.

Apply a curing compound at a rate of application not less than 2 gallons per 25 square yards. The Contractor shall keep the material thoroughly mixed per the Manufacturer's recommendations. The curing compound shall not be diluted.

The finished product shall appear as a uniformly painted solid white surface. Areas exhibiting a blotchy or spotty appearance shall be recoated immediately.

COMPLIANCE WITH STANDARDS

The Engineer will review and approve all material test reports and mix designs supplied by the Contractor before any placement of concrete. The Engineer will visually inspect the placed concrete and review the concrete test reports prior to final acceptance.

Acceptance sampling and testing will be performed using the sampling method and testing option selected by the Engineer. Acceptance testing will be performed at the frequency specified by the Engineer. Quality control measures to insure job control are the responsibility of the Contractor. The Engineer's testing and/or test results will not relieve the Contractor from his/her responsibilities to produce, deliver, and place concrete that meets all project requirements. The Engineer's test results are for acceptance purposes only.

If the results of the testing are not in compliance with the project specifications, the Engineer shall determine appropriate corrective action(s). Time extensions will not be granted to the Contractor during the time that the Engineer is determining the necessary corrective actions.

If, in the Engineer's judgment, the rejected material must be replaced, the material in question will be removed and replaced at the Contractor's sole expense. The removal costs will be deemed to include all relevant and associated costs including, but not limited to; re-mobilization, traffic control, re-grading the aggregate base course, if required, placement of material meeting the project specifications, and all other expenses. Time extensions will not be granted to the Contractor for any required repair work to meet the requirements of this specification.

If the Engineer decides that the material in question can remain in place, an adjustment to the contract unit price(s) may be made of up to 100% of the bid price(s) for the affected items of work.

MEASUREMENT AND PAYMENT

The cost associated with complying with the requirements as described herein, including any required remedial action(s), shall be included in the cost of other items of work and shall not be paid for separately.

CITY OF ANN ARBOR NOTICE TO BIDDERS
EXISTING IN SITU SOILS

The Contractor shall be aware that soils within the City of Ann Arbor and Washtenaw County contain levels of naturally-occurring, regulated, elemental metals.

The City of Ann Arbor is unaware of any previous activities that would have contaminated the existing soils by a hazardous substance as a result of human activity.

In accordance with the applicable project requirements, all excavated material shall become the property of the Contractor. Any excavated material that cannot be incorporated into the project work, in accordance with the material requirements of the work being performed, must be properly disposed of off-site by the Contractor. Consequently, in-situ excavated soils that do not exhibit odors, discoloration, or other indications of contamination are not required to be disposed of in a landfill and may be disposed of by the Contractor by the method of their choice. The City of Ann Arbor suggests a disposal method that minimizes future human contact with the soil or the soil's contact with a water course or ground water sources. The Contractor shall ultimately be responsible for any disposal method they choose.

The Contractor's submittal of a bid for this project shall be considered prima fascie evidence that they have considered these facts and have included all necessary resources to perform all work of this project and to properly dispose of excavated soils from this project off-site.

CITY OF ANN ARBOR SPECIAL PROVISION FOR
CERTIFIED PAYROLL COMPLIANCE AND REPORTING

a. DESCRIPTION - This specification covers all administrative requirements, payroll reporting procedures to be followed by Contractors performing work on City-sponsored public improvements projects, and all other miscellaneous and incidental costs associated with complying with the applicable sections of the City of Ann Arbor Code of Ordinances with regard to payment of prevailing wages and its Prevailing Wage Compliance policy.

This specification is **not** intended to include the actual labor costs associated with the payment of prevailing wages as required. Those costs should be properly incorporated in all other items of work bid.

b. GENERAL - The Contractor is expected to comply with all applicable sections of Federal and State prevailing wage laws, duly promulgated regulations, the City of Ann Arbor Code of Ordinances, and its Prevailing Wage Compliance Policy as defined within the contract documents. The Contractor shall provide the required certified payrolls, city-required declarations, and reports requested elsewhere in the contract documents within the timeline(s) stipulated therein.

The Contractor shall also provide corrected copies of any submitted documents that are found to contain errors, omissions, inconsistencies, or other defects that render the report invalid. The corrected copies shall be provided when requested by the Supervising Professional.

The Contractor shall also attend any required meetings as needed to fully discuss and ensure compliance with the contract requirements regarding prevailing wage compliance. The Contractor shall require all employees engaged in on-site work to participate in, provide the requested information to the extent practicable, and cooperate in the interview process. The City of Ann Arbor will provide the needed language interpreters in order to perform wage rate interviews or other field investigations as needed.

Certified Payrolls may be submitted on City-provided forms or forms used by the Contractor, as long as the Contractor's forms contain all required payroll information. If the Contractor elects to provide their own forms, the forms shall be approved by the Supervising Professional prior to the beginning of on- site work.

c. UNBALANCED BIDDING - The City of Ann Arbor will examine the submitted cost for this item of work prior to contract award. If the City determines, in its sole discretion, that the costs bid by the Contractor for complying with the contract requirements are not reasonable, accurately reported, or may contain discrepancies, the City reserves the right to request additional documentation that fully supports and justifies the price as bid. Should the submitted information not be determined to be reasonable or justify the costs, the City reserves the right to pursue award of the contract to the second low bidder without penalty

or prejudice to any other remedies that it may have or may elect to exercise with respect to the original low-bidder.

The Contract Completion date will not be extended as a result of the City's investigation of the as- bid amount for this item of work, even if the anticipated contract award date must be adjusted. The only exception will be if the Contractor adequately demonstrates that their costs were appropriate and justifiable.

If so, the City will adjust the contract completion date by the number of calendar days commensurate with the length of the investigation, if the published Notice to Proceed date of the work cannot be met. The contract unit prices for all other items of work will not be adjusted regardless of an adjustment of the contract completion date being made.

d. MEASUREMENT AND PAYMENT - The completed work as measured for this item of work will be paid for at the Contract Unit Price for the following Contract (Pay) Item:

Contract Item (Pay Item)	**Pay Unit**
Certified Payroll Compliance and Reporting	Lump Sum

The unit price for this item of work shall include all supervisory, accounting, administrative, and equipment costs needed to monitor and perform all work related to maintaining compliance with the tasks specified in this Detailed Specification, the City of Ann Arbor Code of Ordinances, its Prevailing Wage Compliance policy and the applicable Federal and State laws.

Payment for this work will be made with each progress payment, on a pro-rata basis, based on the percentage of construction completed. When all of the work of this contract has been completed, the measurement of this item shall be 1.0 times the Lump Sum bid amount. This amount will not be increased for any reason, including extensions of time, extra work, and/or adjustments to existing items of work.

CITY OF ANN ARBOR SPECIAL PROVISION FOR
PROJECT SUPERVISION, MAX $175,000

DLZ:LCM 09/16/22

a. DESCRIPTION - The Contractor shall designate a full-time Project Supervisor to act as the Contractor's agent/representative, and to be responsible for scheduling and coordination of all subcontractors, suppliers, other governmental agencies, and all public and private utility companies. The Project Supervisor shall also be responsible for communicating the work schedule with all impacted businesses.

The Project Supervisor shall not be an active crew member of the Contractor, shall not be an active member or employee of any subcontractor's work force, and shall not perform general or specialized labor tasks.

Prior to the pre-construction meeting, the Contractor shall designate a proposed Project Supervisor by name and shall furnish the City of Ann Arbor and the UM with a current, thorough, detailed summary of the proposed Project Supervisor's work history, outlining all previous supervisory experience on projects of a similar size and nature. The detailed work history shall include personal and professional references (names and phone numbers) of persons (previous owners or agents) who can attest to the qualifications and work history of the proposed Project Supervisor. Proposed candidates for Project Supervisor shall have a demonstrated ability to work harmoniously with the City, UM, the public, subcontractors, and all other parties typically involved with work of this nature. The Project Supervisor shall be able to demonstrate that they have filled a supervisory role on at least three projects of similar scope and size within the last 5 years. The Supervising Professional, Engineer, and UM will have the authority to reject a proposed Project Supervisor whom he/she considers unqualified.

The Project Supervisor shall be available 24 hours-per-day to provide proper supervision, coordination and scheduling of the project for the duration of the Contract. The Contractor shall furnish the City with telephone numbers of the Project Supervisor in order to provide 24 hour-per-day access during business and non-business hours, including weekends and holidays.

The Project Supervisor shall be equipped by the Contractor with a mobile telephone to provide the UM with 24 hour- per-day access to him/her during daily construction activities, during transit to and from the construction site, and during all non-business hours including weekends and holidays.

The Project Supervisor shall be equipped with assistants as necessary to provide project supervision as specified herein, and in accordance with the Contract.

b. DUTIES AND RESPONSIBILITIES - The Project Supervisor work harmoniously with the City, UM, the public, subcontractors, and all other parties typically involved with work of this nature.

The Project Supervisor shall have a thorough, detailed understanding and working knowledge of all construction practices and methods specified elsewhere herein, as well as the handling, placement, testing and inspection of aggregates, aggregate products, landscape materials, electrical equipment, pre-cast unit pavers, HMA concrete, and Portland cement concrete materials.

The Project Supervisor shall be responsible for all of the work of all of the Contractor's,

subcontractors' and suppliers' work forces.

The Project Supervisor shall be responsible for proper and adequate maintenance (emissions, safety, and general operation) of all of the Contractor's, subcontractors' and suppliers' equipment and vehicles.

The Project Supervisor is responsible to assure that mail delivery, solid waste, and recycling pick-ups are uninterrupted by the construction.

The Project Supervisor is responsible to coordinate deliveries to the local businesses.

The Project Supervisor shall be responsible for the legal, proper and safe parking/storage of all of the Contractor's, subcontractors' and suppliers' equipment, work vehicles, and employee's vehicles.

The Project Supervisor shall schedule and coordinate the work of all parties involved in the project, including utility companies, testing agencies, governmental agencies, all City departments (such as Utilities and Transportation), the DDA and/or City inspectors, and the impacted businesses.

The Project Supervisor shall coordinate and schedule the work of any independent survey crews that may be retained by the City or UM to witness and reset existing and new geographic/benchmark monuments. Failure to have existing monuments witnessed and reset may result in delays to the Contractor's work. Costs for such delays will be the Contractor's sole responsibility.

The Project Supervisor shall coordinate and schedule both testing inspectors and City and UM inspectors in a timely manner, to assure proper and timely testing and inspection of the work.

The Project Supervisor shall review the Inspector's Daily Reports (IDRs) for accuracy and shall sign all IDRs on a daily basis as the representative of the Contractor. Items to be reviewed include descriptions, locations and measurements of quantities of performed work, workforce, equipment, and weather. The Project Supervisor shall also be responsible for its subcontractors’ review and initialing of IDRs containing work items performed by each respective subcontractor.

The Project Supervisor shall submit to the Engineer, an updated, detailed schedule of the proposed work on a weekly basis, and an update of all proposed changes on a daily basis, all in accordance with the Detailed Specification for Project Schedule contained elsewhere herein.

The Project Supervisor shall schedule and chair a weekly progress meeting with the Engineer and all subcontractors to discuss the work. Upon the completion of each meeting, the Project Supervisor shall prepare and distribute to all present, a written summary of the meeting's minutes. Those in attendance shall review the minutes and, if necessary, comment on any deficiencies or errors prior to or at the next scheduled progress meeting.

The Project Supervisor shall engage with the affected businesses to communicate expectations for the work and to adjust the construction methods and/or times to best accommodate the local businesses.

c. ADDITIONAL PERFORMANCE REQUIREMENTS - If, in the sole opinion of the Supervising Professional, the Project Supervisor is not adequately performing the duties as outlined in this Detailed Specification, the following system of notices will be given to the contractor with the associated penalties:

First Notice – A warning will be issued in writing to the contractor detailing the deficiencies in the Project Supervision. The contractor must respond within 7 calendar days in writing with a plan to correct the stated deficiencies. Failure to respond within 7 calendar days will result in the issuing of a second notice.

Second Notice – A second warning will be issued in writing to the contractor further detailing the deficiencies in the Project Supervision. The contractor must respond within 7 calendar days in writing with a plan to correct the stated deficiencies. Failure to respond within 7 calendar days will result in the issuing of a third notice. A deduction of 10% will be made from the original Project Supervision contract amount. At this time, the City reserves the right to meet with personnel with the necessary authority within the Contractor's organization to discuss the deficiencies in the Project Supervision.

Third Notice – An additional deduction of 25% will be made from the original Project Supervision contract amount, and the Project Supervisor shall be removed from the project and replaced immediately with another individual to be approved by the Supervising Professional.

Should, in the sole opinion of the Supervising Professional, the Project Supervisor fail to perform his/her duties and responsibilities as described herein to such a degree that the successful completion of the project is put in jeopardy, the above system of notices may be foregone, and the Contractor shall immediately replace the Project Supervisor upon receipt of written notice. Failure to provide adequate project supervision, as determined by the Engineer, shall be considered basis for the Supervising Professional to suspend work without extension of contract time or additional compensation.

d. MEASUREMENT AND PAYMENT - This item of work will be paid for on a pro rata basis at the time of each progress payment. Measurement will be based on the ratio between work completed during the payment period and the total contract amount. When all the work of this Contract has been completed, the measurement of this item shall be 1. 0 Lump Sum, minus any deductions incurred for inadequate performance as described herein. This amount will not be increased for any reason, including extensions of time, extras, and/or additional work.

The completed work as measured for this item of work will be paid for at the Contract Unit Price for the following Contract (Pay) Item:

PAY ITEM	**PAY UNIT**
Project Supervision, Max $175,000	Lump Sum

The unit price for this item of work shall include all labor, material, and equipment costs to perform all the work specified in the City Standard Specifications and as modified by this Detailed Specification.

CITY OF ANN ARBOR DETAILED SPECIFICATION
FOR MAINTAINING TRAFFIC AND CONSTRUCTION SEQUENCING

Minor Traffic Devices, Max $50,000
Traf Regulator Control
Barricade, Type III, High Intensity, Double Sided, Lighted, Furn & Oper
Pedestrian Type II Channelizer, Temporary
Plastic Drum, Fluorescent, Furn & Oper
Channelizing Device, 42 inch, Fluorescent, Furn & Oper
Conc Barrier Ending, Temp, Det 2, Furn & Oper & Adj
Conc Barrier, Temp, Furn & Oper & Adj
Conc Barrier, Temp, Limited Deflection, Det 1, Furn & Oper
Conc Barrier, Temp, Limited Deflection, Det 2, Furn & Oper & Adj
Conc Barrier, Temp, Limited Deflection, Det 3A, Furn & Oper
Pavt Mrkg, Longit, 6 inch or Less Width, Rem
Pavt Mrkg, Longit, Greater than 6 inch Width, Rem
Pavt Mrkg, Wet Reflective, Type R, Tape, 4 inch, White, Temp
Pavt Mrkg, Wet Reflective, Type R, Tape, 4 inch, Yellow, Temp
Pavt Mrkg, Wet Reflective, Type R, Tape, Lt Turn Arrow
Pavt Mrkg, Wet Reflective, Type R, Tape, Rt Turn Arrow
Pavt Mrkg, Wet Reflective, Type R, Tape, Thru Arrow
Pavt Mrkg, Wet Reflective, Type R, Tape, Only
Pavt Mrkg, Wet Reflective, Type R, Tape, Rt and Lt Turn Arrow Sym
Pavt Mrkg, Wet Reflective, Type R, Tape, Thru and Rt Turn Arrow Sym
Pavt Mrkg, Wet Reflective, Type R, Tape, 24 inch, Stop Bar
Lighted Arrow, Type C, Furn & Oper
Sign, Portable, Changeable Message, Furn & Oper
Sign, Type A, Temp, Prismatic, Furn & Oper
Sign, Type B, Temp, Prismatic, Furn & Oper
Sign, Type B, Temp, Prismatic, Spec, Furn & Oper

a. General.- Traffic shall be maintained in accordance with Sections 104.11, 810, 811, 812, 919, and 920 of the Michigan Department of Transportation (MDOT) 2020 Standard Specifications for Construction, the 2011 edition of the Michigan Manual of Uniform Traffic Control Devices (MMUTCD) as amended, applicable supplemental specifications, as directed by the Engineer, except as herein provided.

The following, and herein included Michigan Department of Transportation (MDOT) Maintaining Traffic Typicals and Work Zone Device Details apply to the project: 100-GEN-KEY, 101- GEN-SPACING-CHARTS, 102-GEN-NOTES, 103-GEN-SIGN, 107-GEN-SPEED, 110-TR-NFW-2L, 112-TR-CLT, 163-INT-LD-OUT, WZD-100-A, and WZD- 125-E.

These maintaining traffic provisions are subject to change in the event of special community activities.

The Contractor shall furnish, erect, maintain and upon completion of the work remove all traffic control devices and warning lights within the project and around the perimeter of the project for the safety and protection of through and local traffic. This includes, but is not limited to; advance, regulatory, and warning signs; barricades and channeling devices at intersecting streets on which traffic is to be maintained; barricades at the ends of the project and at right-of-way lines of intersecting streets, temporary concrete barriers, temporary pedestrian paths and ramps, and moving traffic control

devices for construction operations.

b. Materials.- The materials and equipment shall meet the requirements specified in the sections designated of the MDOT 2020 Standard Specifications for Construction, the MMUTCD, and all Special Provisions contained in these Contract Documents.

All signs shall be of sizes shown on the plans, unless otherwise directed by the Engineer. Install temporary signs that are to remain in the same place for 14 days or more on driven posts. Install all other temporary signs on portable supports. All signs shall have a minimum bottom height of 7.0 feet.

Channelizing devices required for all lane closures longer than a day shall be plastic drums. 42 inch channelizing devices are permissible for other work with approval from the Engineer. Ensure all devices have sufficient ballast to prevent moving or tipping. If moving or tipping occurs, place additional ballast, as directed by the Engineer, at no additional cost to the project. No more than two ballasts are allowed on each channelizing device. Spacing of drums and channelizing devices shall be 25 feet in curves, shifts, and tapers and 50 feet in tangents.

Do not use caution tape on this project.

Cold Patching Material shall meet the requirements of the City of Ann Arbor Standard Specifications for Construction and as approved by the Engineer.

Use Portable Changeable Message Signs (PCMS's) to warn traffic of upcoming and changing traffic control during the life of the project. Obtain approval from the Engineer for all sign locations.

Install PCMS's and make them operational a minimum of 7 calendar days prior to the start of work, unless otherwise directed by the Engineer. Messages displayed on the PCMS's must conform to MDOT's policy on PCMS's. Notify the Engineer if displaying a different message than those listed below for the project.

Do not leave PCMS's with a blank screen within the clear zone of any roadway at any time. Remove the PCMS or display flashing dots in each corner of the screen when there is no message to display. Update the PCMS messages at the end of each work period to reflect current traffic lane restrictions.

c. Permits.- Prior to the start of construction, the Contractor shall obtain a "Right-of-Way" Permit from City of Ann Arbor Planning and Development Services and a "Lane Closure" Permit from City of Ann Arbor Project Management Services Unit. The fees for these permits will be waived. The Contractor must also obtain an Access License Agreement with the University of Michigan prior to the start of construction. The lane closure permit must be obtained at least 48 hours in advance of any proposed street or lane closing.

d. Work Restrictions.- During non-working periods, any area with uncompleted work shall have plastic drums and barricades at specific locations and protective fencing, as directed by the Engineer, and at no additional cost to the project. Sidewalks/Paths shall also be closed, where shown in the plans, by a minimum of one Pedestrian Type II Barricade and sufficient Pedestrian Type II Channelizer to fully block access to the closed sidewalk and work zone as directed by the Engineer.

Contractor staging/lay down areas shall be fenced with a temporary 6-foot tall, gated chain-link fence, as directed by the Engineer, and at no additional cost to the project.

Do not impact traffic on major streets between the hours of 7:00 a.m. to 9:00 a.m. and from 3:30

p.m. to 6:00 p.m. or on University of Michigan Football Weekends unless otherwise approved by the Engineer or as specified on the Lane Closure Permit. Do not make any traffic control changes between 7:00 a.m and 9:00 a.m. and 3:30 p.m. to 6:00 p.m. in order to minimize interference with rush hour traffic. All traffic controls must be in place and ready for traffic each day by 7:00 a.m. and 3:30 p.m. The Engineer will permit temporary obstruction of traffic for loading and unloading of trucks if the Contractor provides traffic regulators (flag persons) in conformance with Part VI of the MMUTCD. During temporary obstructions, a minimum of two traffic regulators are required.

Maintain access to the University of Michigan, businesses, residences, and side street(s) within the CIA for the duration of the project. The Contractor shall make every effort to coordinate its operations to minimize interruptions that may impact this access. The Contractor shall notify the Engineer forty-eight (48) hours in advance of any work planned on or near business or residential driveways, and stage work so that it is part-width when it is necessary to work in these areas. The Engineer will not allow the Contractor to prohibit access to businesses and residences during any phase of construction, unless agreed upon with the property owner(s). The Engineer may require traffic regulator (flag) control at its discretion and will direct the Contractor to provide it when necessary to maintain safe access to the University of Michigan, businesses, residences, and side street(s).

Contractor shall maintain street lighting at night on the traffic and pedestrian side of East Medical Center Dr. at all times.

e. Construction Influence Area (CIA).- The CIA shall include the area within the Right-of-way along East Medical Center Dr. from Fuller Rd. to Nichols Dr., West Medical Center Dr. from 100 feet southwest of East Medical Center Dr. to East Medical Center Dr., Fuller Rd. from within the Fuller Rd./East Medical Center Dr./Maiden Ln. intersection to 1,100 feet east of the intersection, and Maiden Ln. within the Fuller Rd./East Medical Center Dr./Maiden Ln. intersection. The CIA shall also include the affected portions of the driveways, sidewalks, and construction staging/lay down areas along and contiguous with these roadways.

In addition, the CIA shall include the rights-of-way of all roadway segments used for detours and all locations that contain advance warning and/or regulatory signs, pavement markings, plastic drums, traffic delineators, and all other project related traffic maintenance items.

f. Police, **Fire, and Huron Valley Ambulance -** The Contractor shall notify local police, fire departments and emergency response units a minimum of three business days (72 hours) prior to the closure of any roads, or traffic shifts causing restricted movements of traffic or restricted access.

Signal Modifications

Signal timing and phasing modifications are anticipated for construction at the Fuller Rd./East Medical Center Dr./Maiden Ln., the East Medical Center Dr./West Medical Center Dr., and the East Medical Center Dr./Cancer Center intersections. Modifications may also be required at adjacent intersections. Contractor shall coordinate work with the City of Ann Arbor's Signs and Signals Department ahead of changes in the traffic control.

g. Traffic Signals.- Coordinate the removal or modification of existing traffic signals and installation of temporary or permanent signals with the Engineer.

h. Work Performed by City of Ann Arbor Signs and Signals Unit.- No additional or extra compensation will be paid for any delays caused by City of Ann Arbor Signs and Signals.

Prior to each stage, all temporary and/or permanent traffic signal work necessary for traffic control during that stage must be complete and fully operational.

Adjust placement of temporary signal devices in the field, so that opposing traffic can be seen in a stopped condition where possible, as directed by the Engineer.

Prior to each stage, cover any signal indications or overhead signing in conflict with traffic movements during that stage. Methods of covering signs and signal indications require approval by the Engineer before placement.

If it becomes necessary to perform installation activities in the middle of an intersection where lane closures would be impractical, obtain police assistance. The Engineer will determine the times police assistance may be used at the intersection. Expedite work in the intersection to minimize the time police assistance is required.

i. Temporary Barrier (TB).

Perform barrier operations such as slip forming or placing temporary concrete barrier with the flow of the traffic. Place the end treatment first when deploying the TB and remove the end treatment last when removing the TB.

Do not place TB on slopes that are steeper than 1:10.

Place TB in accordance with Standard Plan R-126 Series. At no time will traffic be exposed to the blunt end of TB or permanent barrier wall without proper attenuation.

j. Maintenance of Traffic, General.- The Contractor shall maintain at least one 11-foot lane of through traffic in each direction along each street during the course of the Project's construction. Contractor shall schedule work in order to maintain traffic flow and under no circumstances stop traffic for prolonged periods as determined by the Engineer.

The Contractor shall coordinate their operations with all Utilities, Contractors and/or sub- Contractors performing work on this and other projects within, or adjacent to, the Construction Influence Area (CIA). The contractor shall avoid conflicts in maintaining traffic operations, signing, and orderly progress of other contract work.

k. Maintenance.- University of Michigan and City of Ann Arbor driveways shall be maintained at all times. A minimum of one (1) driveway shall be maintained at all times to all residences and businesses. Walks, driveways, and entrances to residences and businesses shall not be blocked. Vehicular and pedestrian access shall be maintained to all properties.

Exploratory Excavations, utility crossings, and all other openings created by the Work over which vehicular traffic will be maintained shall receive a minimum cover of 3 inches of Cold-Patching material that is thoroughly compacted in place.

l. Signs and Pavement Markings.- When lane closures are in place, the Contractor shall completely cover all conflicting warning, regulatory and guide signs in accordance with Section 812.03.D.2 of the Standard Specifications for Construction, 2020 edition, and all applicable details therein.

Remove conflicting pavement markings, pavement markings in taper/transition areas and other markings as directed by the Engineer, for operations occupying a location longer than 3 days. Durable markings in these areas should be covered rather than be removed.

Quantities for temporary tape to be placed during paving operations are based on the MDOT PAVE 900 Series standard plans.

When Type R tape is used, ensure that all temporary pavement markings adhere to the pavement surface until permanent markings are installed.

Complete temporary pavement markings in each stage prior to shifting traffic as directed by the Engineer.

Replace all existing pavement markings that are removed for traffic control or obliterated during construction.

m. Traffic Regulator Control.- Contractor will provide for Traffic Regulator Control as noted herein, and as directed by the Engineer. Flag Persons performing this work must have adequate professional experience and safety training to perform the work of directing and managing the movement of pedestrians, vehicles, and other sidewalk and street users in a manner that protects the safety of all those present on the job site.

Contractor is to coordinate with the Engineer on the timing and need for Traffic Regulator Control operations.

Crossroads must remain open to traffic at all times. Use intermediate traffic regulators at each intersection approach and commercial driveways within the closure limits, as directed by the Engineer. Use traffic regulator control as directed by the Engineer for cross street traffic while paving through intersections.

n. Construction.- This provision does not detail all the project work. It is intended to indicate major project requirements and assist the Contractor in developing, for the review and approval of the Engineer, the Progress Schedule for the project.

The Contractor shall notify the Engineer a minimum of 5 working days prior to the implementation of any detours, road closures, ramp or lane closures, and major traffic shifts. The Contractor shall also notify City of Ann Arbor Signs and Signals regarding signal work as specified in the section entitled “Work Performed by City of Ann Arbor Signs and Signals Unit.”

Contractor required to perform dewatering required to construct utilities as required at no additional cost.

Stage 1: Fuller Road crossover widening and East Medical Center Drive widening.

Traffic:

1. On East Medical Center Dr., close the outside westbound lane and maintain one through lane in each direction and a center turn lane between West Medical Center Dr. and Nichols Dr. as shown in the plans.
2. On West Medical Center Dr., close the outside northbound lane and maintain one through lane in each direction at the East Medical Center Dr./West Medical Center Dr. intersection as shown in the plans.

3. On Fuller Rd., maintain two through lanes in each direction at all times between the hours of 7:00 a.m. to 9:00 a.m. and 3:30 p.m. to 6:00 p.m. During work directly adjacent to westbound Fuller Rd., close one lane at a time for a maximum of 48 cumulative hours as directed by the Engineer. Maintain access to the eastbound Fuller Rd. to the Fuller Park crossover as well as for the Fuller Park driveway.

Pedestrians and Bicyclists:

1. Maintain all existing sidewalks/paths and sidewalk ramps except for the northwest and southwest quadrants of the East Medical Center Dr./West Medical Center Dr. intersection as shown in the plans. In the southwest quadrant, utilize Temporary Pedestrian Barricades to block the sidewalk from West Medical Center Dr. at the north end and from East Medical Center Dr. on the south end. In the northeast quadrant, utilize Pedestrian Type II Channelizer to direct pedestrians around the corner to the west along the north side of West Medical Center Dr.

2. Detour pedestrians and bicyclists on the west side of East Medical Center Dr. headed toward the Cancer Center, Main Hospital and Mott Children's Hospital to the east side of East Medical Center Dr. and toward the south to the crosswalk at the Cancer Center entrance as shown in the plans and/or as directed by the Engineer.

Work Tasks:

1. Construct Contractor staging/lay down areas as shown in the plans and as directed by the Engineer.
2. Construct the temporary traffic signal at the East Medical Center Dr./West Medical Center Dr. intersection. Relocate the northwest pedestrian pushbutton at East Medical Center Dr./Cancer Center intersection.
3. Construct the permanent sidewalk and ramp on the west side of East Medical Center Dr. between West Medical Center Dr. and the Cancer Center entrance.
4. Relocate the ground mounted University of Michigan sign at the Cancer Center driveway. Coordinate a temporary storage location of the sign after it is removed with the University of Michigan.
5. Adjust the University of Michigan telecommunication manhole in the northeast corner of the East Medical Center Dr./West Medical Center Dr. intersection.
6. Construct the additional turn lane and sidewalk along eastbound East Medical Center Dr. between West Medical Center Dr. and Cancer Center.
7. Widen the eastbound Fuller Rd. to Fuller Park crossover and the driveway island for the Fuller Park driveway.
8. Restore non-paved areas as shown in the plans.

Stage 2: East Medical Center Drive bridge and road construction (west side)

Traffic:

1. On East Medical Center Dr., close the outside westbound lane and maintain one through lane in each direction and a center turn lane between West Medical Center Dr. and Nichols Dr. as shown in the plans. Between West Medical Center Dr. and Fuller Rd. maintain one lane in each direction on the east side of the existing bridge as shown in the plans. Detour the northbound East Medical Center Dr. to westbound Fuller Rd. left turn to the widened crossover on Fuller Rd. east of the intersection as shown in the plans.
2. On West Medical Center Dr., close the existing southbound lane and maintain one through lane in each direction at the East Medical Center Dr./West Medical Center Dr. intersection as shown in the plans.
3. On Maiden Ln., close the southbound left turn lane at the Fuller Rd./East Medical Center Dr./Maiden Ln. intersection and detour the southbound Maiden Ln. to eastbound Fuller Rd. left turn as shown in the plans.

Pedestrians and Bicyclists:

1. Maintain all existing sidewalks/paths and sidewalk ramps except for the west side of East Medical Center Dr. between West Medical Center Dr. and Fuller Rd. and the north side of West Medical Center Dr.
2. Detour pedestrians and bicyclists for the closed sidewalks/paths to the east side of East Medical Center Dr. as shown in the plans.

Work Tasks:

1. Construct the temporary traffic signal at the Fuller Rd./East Medical Center Dr./Maiden Ln. intersection. Relocate traffic signal heads on the East Medical Center Dr./West Medical Center Dr. intersection temporary traffic signal.
2. Place temporary concrete barrier along East Medical Center Dr. and West Medical Center Dr. as shown in the plans.
3. Relocate the ground mounted University of Michigan sign at the East Medical Center Dr./West Medical Center Dr. intersection. Coordinate a temporary storage location of the sign after it is removed with the University of Michigan.
4. Construct the west half of the East Medical Center Dr. bridge as shown in the plans including the following:
    a. Remove the existing deck, beams, pier cap and portions of the abutments.
    b. Construct the proposed portions of the abutments, including widening.
    c. Construct the proposed widened portion of piers and proposed pier cap.
    d. Erect/Re-erect structural steel including beams: BB, AA, A, B, C, and D.
    e. Construct the west portion of the deck to staging limits as shown on the plans, including backwalls, sidewalks and railings.
5. Construct University of Michigan conduit on the west side of East Medical Center Dr. as shown in the plans.
6. Coordinate with AT&T allowing them to complete their conduit connection and install their cable on the west side of East Medical Center Dr. AT&T has estimated needing a full 6 weeks for this task.
7. Coordinate with University of Michigan to disconnect electrical power to University of Michigan streetlights on the west side of the bridge and maintain power to the east side streetlights. Install the new streetlights on the west half of the East Medical Center Dr. Bridge.
8. Construct the western half of the City of Ann Arbor's conduits crossing East Medical Center Dr.
9. Construct the west half bridge approach roadway work and sidewalks for East Medical Center Dr. as shown in the plans.
10. Restore non-paved areas as shown in the plans.

Stage 3: East Medical Center Drive bridge and road construction (east side)

Traffic:

1. On East Medical Center Dr., close the outside westbound lane and maintain one through lane in each direction and a center turn lane between West Medical Center Dr. and Nichols Dr. as shown in the plans. Between West Medical Center Dr. and Fuller Rd. maintain one lane in each direction on the west side of the existing bridge as shown in the plans. Detour the northbound East Medical Center Dr. to westbound Fuller Rd. left turn to the widened crossover on Fuller Rd. east of the intersection as shown in the plans.
2. On West Medical Center Dr., maintain all lanes as shown in the plans.
3. On Maiden Ln., close the southbound left turn lane at the Fuller Rd./East Medical Center Dr./Maiden Ln. intersection and detour the southbound Maiden Ln. to eastbound Fuller Rd. left turn as shown in the plans.

Pedestrians and Bicyclists:

1. Maintain all existing sidewalks/paths and sidewalk ramps except for the east side of East Medical Center Dr. between West Medical Center Dr. and Fuller Rd.
2. Detour pedestrians and bicyclists for the closed sidewalks/paths to the west side of East Medical Center Dr. as shown in the plans.

Work Tasks:

1. Relocate traffic signal heads at the Fuller Rd./East Medical Center Dr./Maiden Ln. intersection temporary traffic signal. Relocate the East Medical Center Dr./West Medical Center Dr. intersection temporary traffic signal.
2. Place temporary concrete barrier along East Medical Center Dr. as shown in the plans.
3. Construct the east half of the East Medical Center Dr. bridge as shown in the plans including the following:
    a. Remove the existing deck, beams, pier cap and portions of the abutments.
    b. Construct the proposed portions of the abutments.
    c. Construct the proposed pier cap.
    d. Re-erect structural steel including beams: E, F, G, H, J, K, L, and M.
    e. Construct the east portion of the deck to staging limits as shown on the plans, including backwalls, sidewalks and railings.
4. Construct street lighting on east half of East Medical Center Dr. ensuring that the street lighting on west side of East Medical Center Dr. remains operational.
5. Construct the eastern half of the City of Ann Arbor's conduits crossing East Medical Center Dr.
6. Construct the east half bridge approach roadway work and sidewalks for East Medical Center Dr. as shown in the plans.
7. Restore non-paved areas as shown in the plans.

Stage 4: East Medical Center Dr. and West Medical Center Dr. cold milling, resurfacing, pavement markings, and signing

Traffic:

1. On East Medical Center Dr., maintain one lane in each direction utilizing traffic regulator control, lane closures, and lane shifts during the hours of 7 p.m. to 6 a.m. For the remainder of the day, maintain all lanes.
2. On West Medical Center Dr., maintain one bi-directional lane utilizing traffic regulator control, lane closures, and lane shifts during the hours of 7 p.m. to 6 a.m. For the remainder of the day, maintain all lanes.
3. All traffic controls for daytime traffic must be in place and ready by 6 a.m.
4. For nighttime work during this stage, the Contractor shall submit a lane-by-lane maintenance of traffic plan to the City of Ann Arbor, 30 working days in advance of beginning cold milling. This plan shall include drawings, traffic regulator locations, temporary signing, barricades, and channelization device locations.

Pedestrians and Bicyclists:

1. Maintain all existing sidewalks/paths and sidewalk ramps between 6 a.m. and 7 p.m.
2. Detour pedestrians and bicyclists as required using traffic regulators between 7 p.m. and 6 a.m. as directed by the Engineer.

Work Tasks:

1. Remove the Fuller Rd./East Medical Center Dr./Maiden Ln. intersection and the East Medical Center Dr./West Medical Center Dr. intersection temporary traffic signals.

2. Cold mill East Medical Center Dr. and West Medical Center Dr. as shown in the plans. Traffic shall not be allowed to drive on cold milled surfaces.
3. Pave the bituminous wearing course for East Medical Center Dr. and West Medical Center Dr. as shown in the plans. Adjust structures, if required, immediately prior to paving.
4. Place permanent pavement markings and signing.
5. Remove Contractor staging/lay down areas.
6. Restore non-paved areas as shown in the plans.

Stage 5: East Medical Center Dr. epoxy overlay, pavement markings on the bridge, and restoration

Traffic:
1. On East Medical Center Dr., maintain one lane in each direction utilizing traffic regulator control, lane closures, and lane shifts during the hours of 7 p.m. to 6 a.m. For the remainder of the day, maintain all lanes.
2. All traffic controls for daytime traffic must be in place and ready by 6 a.m.
3. For nighttime work in this stage, the Contractor shall submit a lane-by-lane maintenance of traffic plan to the City of Ann Arbor, 30 working days in advance of beginning epoxy overlay. This plan shall include drawings, traffic regulator locations, temporary signing, barricades, and channelization device locations.

Pedestrians and Bicyclists:
1. Maintain all existing sidewalks/paths and sidewalk ramps.

Work Tasks:
1. Apply epoxy overlay to the East Medical Center Dr. bridge.
2. Place permanent pavement markings on the East Medical Center Dr. bridge.
3. If needed, complete restoration of non-paved areas as shown on plans as directed by Engineer. No lane closures are allowed for this work and it does not need to be done between 7 p.m. to 6 a.m.

o. Work Tasks Common to all Stages - The following major work tasks are included in each stage of work in addition to work described above:

1. Implement the traffic control as shown on the project plans, and as directed by the Engineer for this stage of the construction. Coordinate with the City of Ann Arbor Signs and Signals Unit as needed.

2. Install all needed soil erosion and sedimentation control measures. The Contractor shall install only those devices necessary to perform the work of this particular stage or to meet the appropriate Federal, State, or Local regulations.

3. Coordinate with City when installing all signing. Temporarily cover signs in conflict with construction maintenance of traffic.

4. Reasonable access to all side streets and driveways shall be maintained at all times. The Contractor is to coordinate construction in front of driveways, and the actual driveway construction (where applicable), with affected property owners as detailed elsewhere herein.

p. Detours. - Signs should be on both sides of the roadway when the work is taking place on the freeway or a boulevard section.

Cover all detour signs installed prior to closing a road or ramp. Do not uncover detour signing until just before the closure is in effect. Immediately remove or cover all detour signing upon opening the road or ramp to traffic.

q. Pedestrian or Non-Motorized Facilities. - Maintain all facilities in accordance with *The Americans with Disability Act* (ADA) requirements, the Public Rights-of Way Accessibility Guidelines (PROWAG), and City of Ann Arbor and the University of Michigan requirements. Provide facilities equivalent to or better than the route a person would have encountered prior to construction activities.

Close and detour any sidewalk ramps and crosswalk areas to pedestrian traffic that are impacted by the work. Cover pedestrian signal heads when the crosswalk or ramp is affected.

Keep sidewalk areas clear of any equipment or materials at all times the sidewalks are open to pedestrian traffic.

r. Earthwork and Excavation. - Restore undercuts or excavations in the work areas within 3 feet of the active traffic lanes to no steeper than a 1 on 4 slope from the edge of the roadway at the end of each work day. If this condition is not met, provide a nighttime closure.

Delineate excavated areas located within 3 feet of traffic with channelizing devices at 20 feet spacing along the excavated area, and 100 feet before the area, or as shown on the maintaining traffic plans.

Use protective fencing to protect open excavations within the work zone during non-working hours.

s. Bituminous Paving.- The Contractor shall perform the work of this Contract while maintaining traffic in accordance with Contract Documents as specified herein. No traffic shall be allowed on newly placed asphalt surfaces until rolling has been satisfactorily completed and the surface has cooled sufficiently to prevent damage from traffic. This is to be accomplished by traffic regulators (flag persons) and by relocating traffic control devices to prevent traffic from entering the work area until such time that traffic can be safely maintained without damaging the new construction. The Contractor shall provide traffic regulators in sufficient number to maintain traffic as described herein, and to keep traffic off sections being surfaced, and provide for safe travel at all times as directed by the Engineer.

Each pressure distributor, paver and roller shall be equipped with at least one approved flasher light which shall be mounted on the equipment so as to give a warning signal ahead and behind.

The paving of the top course shall be conducted under traffic by utilizing traffic regulators (flag persons), lane closures, traffic shifts, channelizing devices and signs in accordance with Part VI of the current edition of the Michigan Manual of Uniform Traffic Control devices (MMUTCD) as amended. The installation and removal of minor traffic control devices needed for the maintenance of traffic during the paving of final wearing course and the furnishing of traffic regulators shall be paid as “Minor Traffic Devices” and “Traffic Regulator Control” as appropriate.

Resurface all HMA milled areas the same day as the HMA cold milling operation. No traffic is allowed on the HMA milled surface, unless directed by the Engineer.

t. Bridge Work. - Provide 28 days minimum for curing concrete prior to application of concrete surface coating, concrete healer sealer, or thin epoxy overlays.

The following bridge work items are designated night work. This list does not restrict other work from taking place at night, and additional work items may be required to take place at night per other restrictions and requirements:

1. Bridge deck pour.

u. Measurement and Payment.- The estimated quantities for maintaining traffic is based on the maintenance of traffic plans. Any additional signing, traffic control devices, pavement markings, or the like required to expedite the construction, beyond that which is specified, shall be at the Contractor's sole expense.

The completed work as measured shall be paid at the contract unit price for the following contract pay items:

Contract Pay Item	**Pay Unit**
Minor Traffic Devices, Max $50,000	LSUM
Traf Regulator Control	LSUM
Barricade, Type III, High Intensity, Double Sided, Lighted, Furn & Oper	Each
Pedestrian Type II Channelizer, Temporary	Linear Foot
Plastic Drum, Fluorescent, Furn & Oper	Each
Channelizing Device, 42 inch, Fluorescent, Furn & Oper	Each
Conc Barrier Ending, Temp, Det 2, Furn & Oper & Adj	Each
Conc Barrier, Temp, Furn & Oper & Adj	Linear Foot
Conc Barrier, Temp, Limited Deflection, Det 1, Furn & Oper	Linear Foot
Conc Barrier, Temp, Limited Deflection, Det 2, Furn & Oper & Adj	Linear Foot
Conc Barrier, Temp, Limited Deflection, Det 3A, Furn & Oper	Linear Foot
Pavt Mrkg, Longit, 6 inch or Less Width, Rem	Linear Foot
Pavt Mrkg, Longit, Greater than 6 inch Width, Rem	Linear Foot
Pavt Mrkg, Wet Reflective, Type R, Tape, 4 inch, White, Temp	Linear Foot
Pavt Mrkg, Wet Reflective, Type R, Tape, 4 inch, Yellow, Temp	Linear Foot
Pavt Mrkg, Wet Reflective, Type R, Tape, Lt Turn Arrow	Each
Pavt Mrkg, Wet Reflective, Type R, Tape, Rt Turn Arrow	Each
Pavt Mrkg, Wet Reflective, Type R, Tape, Thru Arrow	Each
Pavt Mrkg, Wet Reflective, Type R, Tape, Only	Each
Pavt Mrkg, Wet Reflective, Type R, Tape, Rt and Lt Turn Arrow Sym	Each
Pavt Mrkg, Wet Reflective, Type R, Tape, Thru and Rt Turn Arrow Sym	Each
Pavt Mrkg, Wet Reflective, Type R, Tape, 24 inch, Stop Bar	Linear Foot
Lighted Arrow, Type C, Furn & Oper	Each
Sign, Portable, Changeable Message, Furn & Oper	Each
Sign, Type A, Temp, Prismatic, Furn & Oper	Square Foot
Sign, Type B, Temp, Prismatic, Furn & Oper	Square Foot
Sign, Type B, Temp, Prismatic, Spec, Furn & Oper	Square Foot

The unit price for this item of work shall include all labor, material, and equipment costs required to perform the work specified herein and includes both furnishing and operating the devices.

DETAILED SPECIFICATION FOR
PROGRESS CLAUSE

PROGRESS CLAUSE: The Contract Award is expected on March 1, 2024. In no case shall any work be commenced prior to receipt of formal notice to proceed by the City of Ann Arbor.

The work shall be completed in a methodical sequence of activity (or "stages") moving through the project site, as indicated in the *Detailed Specification for Maintaining Traffic and Construction Sequencing and the Maintenance of Traffic Plans*; and within the Stages noted on the plans and herein. The Contractor may propose alternative ideas to the phasing and scheduling of the work for consideration by the City of Ann Arbor. If, after consideration, the Engineer believes that the alternative proposed is beneficial to the City, they may opt to accept the proposed alternative.

In general, the project will proceed in five Stages and be completed over two construction seasons:

- Stage 1 (2024): Fuller Road crossover widening and East Medical Center Dr. widening.
- Stage 2 (2024): East Medical Center Dr. bridge and road construction (west side).
- Stage 3 (2024): East Medical Center Dr. bridge and road construction (east side).
- Stage 4 (2024): East Medical Center Dr. and West Medical Center Dr. Coldmilling, resurfacing, pavement marking, and signing.
- Stage 5 (2025): Final restoration and epoxy overlay on the East Medical Center Dr. bridge.

During all Stages, disruption to intersections shall be minimized and no work will be allowed during the dates and event listed herein.

The Project takes place within the entrance of a busy bridge to a University of Michigan Medical Campus. The Contractor is required to work with the City of Ann Arbor and the University of Michigan to sequence work to minimize disruptions as much as possible.

Pedestrian access to the hospital must be maintained throughout the construction period. At a minimum one sidewalk must be open at all times. All pedestrian access shall be ADA compliant.

Vehicular, solid waste, and pedestrian access must be provided to parking lots, service areas, and alleys at all times. Work in these areas will be coordinated to provide at a minimum, partial width and temporary access as needed. The Contractor will be required to coordinate and communicate with property owners and tenants that may be impacted.

The Contractor may propose to adjust the limits or sequencing of construction in order to complete the work more efficiently. Changes to the recommended construction sequence must be approved in writing by the Engineer prior to construction and must assure all required coordination with other projects and timelines.

The Contractor for the work covered by this proposal will be required to meet with the Engineer to work out a detailed Progress Schedule. The schedule for this meeting will be set within two weeks after the approved contractor is determined. Prior to this meeting the contractor will also submit for review and

approval a Project Schedule consisting of sequence of operations and staging plan to complete the work by the specified completion date.

The named subcontractor(s) for Specialty and/or Designed Items (if such items are designated in the proposal) which materially affect the work schedule shall also be present at the scheduled meeting, and they will be required to sign the Progress Schedule to indicate their approval of the scheduled dates of work set forth in the Progress Schedule.

The Engineer will arrange the time and place for the meeting.

The Plans and Detailed Specifications describe logistics, coordination and scheduling requirements of the Project which shall be included in the Progress Schedule and otherwise conformed to. Work will be allowed from 7am – 8pm, Monday – Saturday, except for night work required as detailed in plans and the specifications. Exceptions to work outside those hours are made on a case-by-case basis only and require City administration approval.

Work beyond these hours is subject to the approval of the Engineer, and subject to approval of an extended hours work permit application by the City of Ann Arbor.

Certain work activities such as hauling of material may be limited on home football Saturdays in the Fall due to closure of several streets/ traffic.

Project Stages Description:

As this project includes direct access to UM Medical campus and also serves as a bus route for both the University of Michigan and the AAATA, and experiences high volumes of pedestrian traffic, it is vital that each Stage of work and its completion be coordinated, efficient, and timely to ensure that roadway operations are safe to travel for all users.

Time is of the essence in the performance of the work of this contract. The Contractor is expected to mobilize sufficient personnel and equipment, and work within authorized hours in order to complete the project by the final completion date. Costs for the Contractor to organize, coordinate, and schedule all of the work of the project, will not be paid for separately, but shall be included in the bid price of the Contract Item "General Conditions."

The Stages of construction are described in the *Detailed Specification for Maintaining Traffic and Construction Sequencing*, other detailed specifications, and on the plans.

At a minimum the following work must be completed by **December 1, 2024**, unless approved otherwise by the City of Ann Arbor:

1) Bridge and full depth roadway construction complete and fully open to traffic.
2) Sidewalks and sidewalk ramp construction, on and off the bridge, complete and fully open to pedestrians and bicycles
3) Lighting and electrical work
4) UM, City and AT&T conduit construction.

Liquidated Damages in the amount of **$5,000 per calendar day** will be charged for delays beyond the completion date for the work listed above.

For Stages 4 and 5 nighttime work, Liquidated Damages in the amount of **$1,000 per hour** will be charged for delays to fully opening all lanes to traffic and sidewalks to pedestrians and bicycles by 6:00 a.m.

The entire project must be fully complete by **July 1, 2025**, unless approved otherwise by the City of Ann Arbor.

Liquidated Damages in the amount of **$5,000 per calendar day** will be charged for delays beyond the final completion date listed above.

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

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

A. To any preference, priority or allocation order duly issued by the City of Ann Arbor.

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

C. To any delays of Subcontractors occasioned by any of the causes specified in Items A and B of this section.

Should the Engineer approve a request for extension of time and revise any contract completion date(s), the Liquidated Damages will be based on the revised date(s) for which the time extensions specifically apply.

Measurement and Payment.-

Liquidated Damages will be assessed until all required work is completed as defined herein. There are no maximum limits on the Liquidated Damages amounts that may be charged to the Contractor. There will be no seasonal suspension of Liquidated Damages except as otherwise provided for herein.

CITY OF ANN ARBOR SPECIAL
PROVISION FOR
MACHINE GRADING, MODIFIED

DLZ:LCM 09/16/22

a. DESCRIPTION - This work shall consist of constructing earth grades by excavating, cutting, filling, trimming, and grading; general restoration, removal and salvage of miscellaneous site amenities, and maintaining the work in a finished condition until such time that it is accepted by the Engineer. This work shall be done as shown on the Plans, as detailed in the Specifications, and as directed by the Engineer, and in accordance with Section 205 of the 2020 MDOT Standard Specification for Construction, except as specified herein.

The drawings indicate work to be completed outside of the right of way on property owned by private parties. This work is an extension of the right of way work and will be paid for based on the applicable unit prices. Machine Grading, Modified will be extended to the limits of grading as shown on the plans where work includes property adjacent to the right of way.

b. MATERIALS - All materials shall meet the requirements as specified in Section 205 of the MDOT 2020 Standard Specifications for Construction, except as specified herein.

c. CONSTRUCTION METHOD

Machine Grading: The Contractor shall construct earth grades as required to develop the typical and/or detailed cross- section(s) as shown on the Plans, as detailed in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, the excavation of soil, rocks of any size, stumps, logs, and bricks; the removal and proper disposal off-site of surplus excavated material; the scarifying, plowing, disking, moving and shaping of earth; the trimming, grading, compaction and proof-rolling of the prepared subgrade; the importing, furnishing, placement and compaction of embankment and/or fill materials; the full depth saw- cutting of pavement at the removal limits; the grading of side slopes; general restoration in accordance with the detailed Specifications elsewhere herein and the general items of the work as specified herein. Road subbase and base materials shall be paid for separately. The subgrade shall be constructed in accordance with Section 205.03.G (Earth Excavation) and Section
205.03 H (Roadway Embankment) of the MDOT 2020 SSC, as shown on the plans, and as specified herein.

The Contractor shall remove, add to, re-shape, re-grade, and re-compact the existing roadbed materials, and shall construct the roadway and sidewalk area to the cross-section(s) as indicated on the Plans, as detailed in the Specifications, and as directed by the Engineer.

The existing site includes irrigation system that is to be abandoned. As part of Machine Grading the Contractor is to ensure that the system is no longer active with water pressure, then remove any remaining irrigation equipment uncovered during the work, and properly dispose of all materials off site.

As part of Machine Grading the Contractor shall remove other surface features, including, but not limited to, signs, concrete filled steel bollards, and bicycle parking hoops located within the

grading limits and not otherwise identified, as directed by the Engineer. Signs shall be salvaged and provided to City as directed by the Engineer.

The Contractor shall move excavated and/or imported materials longitudinally and/or transversely where necessary, and as directed by Engineer.

The Contractor shall keep the project site well graded and drained at all times. Foundation, roadway or sidewalk embankment or subgrade that becomes damaged by rain shall be undercut and backfilled, or otherwise remedied, by the Contractor, at his/her sole expense, as directed by the Engineer.

The Contractor shall not use rubber-tired equipment on the subgrade, when its use causes or may cause, in the opinion of the Engineer, damage to the subgrade. The Contractor shall conduct its operation(s), and provide all necessary equipment, to ensure the satisfactory completion of the work without damaging the subgrade. This includes the transporting, stockpiling, re-handling, and movement of materials over additional distances, in lieu of driving on an unprotected, or partially unprotected, subgrade.

The Contractor is solely responsible for the maintenance and protection of the subgrade. Further, any damage to the subgrade which, in the opinion of the Engineer, is caused as a result of the Contractor's operation(s), or its subcontractors' or suppliers' operation(s), shall be repaired by the Contractor at the Contractor's expense. This includes any additional earthwork and/or maintenance materials as directed by the Engineer, for the purposes of the Contractor's maintenance and protection of the subgrade. The Contractor shall not be entitled to any additional compensation for the implementation of these procedures.

The Contractor shall perform all rough and/or finish grading and compaction in the right of way to the grades shown on the Plans, as detailed in the Specifications, and as directed by the Engineer. The finished subgrade shall be placed to within 1 inch below and ¾ inch above plan grade. Variations within this tolerance shall be gradual.

The subgrade shall be compacted to a minimum of 95% of its maximum unit weight, as measured by the AASHTO T-180 method, to a depth of 10 inches. The Contractor shall proof roll all graded and compacted surfaces in the presence of the Engineer as detailed in the Specifications. The Engineer will monitor the proof rolling operation to locate deleterious and/or uncompacted materials and will direct undercuts as necessary.

The Contractor shall take any and all steps necessary to avoid interruption in the mail delivery, and solid waste, recycling, and compostable pick-up within the project limits. This shall include the temporary relocation of mailboxes, where required by the Engineer, as well as moving of all solid waste/recycling/compost containers to the nearest cross street.

The Contractor shall coordinate with the City Forester prior to the removal of any tree

roots 2 inches or larger in size.

Machine Grading includes reviewing the condition of existing sand base in sidewalk areas with the Engineer, and grading and compacting the subgrade and sand to meet grade requirements for the sidewalk zone. If the existing sand base must be removed due to poor condition, the removal will be paid for as part of Machine Grading, Modified, and the replacement sand base paid as Sand Subbase Course, Class II - C.I.P.

The Contractor shall restore all disturbed areas to better than or equal to their original condition. This includes the placement and compaction of 5 inches of topsoil, followed by the placement of grass seed, followed by the placement of 0.5 inches of topsoil at all turf restoration locations, and at locations where concrete items are removed and turf is to be established. All restoration work and materials shall be in accordance with the City Standard Specifications. Restoration work must be performed within one week of the placement of the wearing course for each street. Such restoration will be considered part of Machine Grading, Modified.

Pavement Sawcutting - The work shall include the full-depth saw-cutting of pavement at the construction limits, and elsewhere as required, if not paid for as part of another item of work. Pavement sawcutting will not be paid for separately.

Removal of Trees and Vegetation - The Contractor shall remove and properly dispose of off-site all vegetation; brush; roots; and trees and stumps less than 6 inch in diameter, as shown on the plans, and as directed by the Engineer as required to complete the project.

Removing and Salvaging Topsoil - The removal, salvaging and stockpiling of topsoil, and all related work, shall be performed in accordance with Section 205.03.A.1 (Removing and Salvaging Topsoil) of the MDOT 2020 SSC.

Protection of Utilities - Utility lines may become exposed at, above, or below, the foundation or subgrade elevation during machine grading or subgrade undercutting operations. If this occurs, the Contractor shall excavate around, above and/or below the utility lines, as directed, to complete the machine grading or subgrade undercutting operations. Payment, at contract unit prices, for "Machine Grading, Modified " or "Subgrade Undercutting, Type _," whichever applies, will be considered as payment in full for this work.

Protection of Trees to Remain – Trees to remain shall be protected from damage due to mechanical equipment, tree root compaction and cutting, and removal of bark and branches.

d. MEASUREMENT AND PAYMENT – Measurement for payment for the item "Machine Grading Modified" shall be the computed by road station (as further described below). Embankment, fill, compaction, proof rolling, subgrade protection/maintenance, and drainage maintenance will not be paid for separately, and are included in this item of work.

The completed work as measured for this item of work will be paid for at the Contract Unit Price for the following Contract (Pay) Item:

PAY ITEM	**PAY UNIT**
Machine Grading, Modified	Station

"Station" in the **Machine Grading, Modified** pay unit is defined as a one hundred foot length of street as stationed on the plans; each "Station" pay unit is measure longitudinally for every 100 feet or fraction thereof, and is measure from the center line of the right of way to the edge of the right of way (that being one half of the right of way).

The pay item "Machine Grading, Modified" shall include all the work specified herein, including, but not limited to, the removal and offsite disposal of any surplus or unsuitable materials and the furnishing from off-site any additional Engineer approved fill materials necessary to construct the embankment and subgrade to the contours and cross-sections shown on the plans.

CITY OF ANN ARBOR SPECIAL
PROVISION FOR
NON-HAZARDOUS CONTAMINATED MATERIAL HANDLNG AND DISPOSAL (LM)

DLZ:LCM 09/16/22

a. Description. This work shall include all labor, equipment, and materials necessary to handle, transport, and dispose of non-hazardous contaminated material as described herein, as directed by the Engineer.

An area within the project limits has been identified as a potential site of soils which include non-hazardous contaminated material. Should the City determine that soils in the project site include non-hazardous contaminated material these materials shall not be used elsewhere or disposed of in a manner inconsistent with this special provision, or applicable federal, state, or local regulations unless otherwise directed by the Engineer.

b. Method of Construction. This work shall be performed in accordance with Sections 204 and 205 of the MDOT 2020 Standard Specifications for Construction, except as modified herein or as directed by the Engineer.

The Contractor shall have all manifests signed by its representative, the Engineer's representative, the authorized representative of the waste hauler and the waste disposal facility.

c. Excavation of Non-Hazardous Contaminated Material. Non-Hazardous contaminated material shall be excavated as directed by the Engineer.

d. Temporary Storage of Non-Hazardous Contaminated Material. Excavated non- hazardous contaminated material which is to be temporarily stockpiled shall be placed on plastic sheeting or tarps having a minimum thickness of 6 mils or in trucks, roll-off boxes, or other containers, such that no liquid may escape from the containment. At the end of each work day, the non-hazardous contaminated material shall be covered securely with plastic sheeting of 6 mils thickness or greater.

Excavated non-hazardous material shall be disposed of as soon as approval is received from the disposal site. In no case shall this material be stockpiled for longer than 30 days prior to disposal.

The Contractor is responsible for the necessary coordination such that his/her work activities are not adversely impacted by the stockpiling of contaminated soil. Stockpiled soil shall not impair sight distance or drainage.

e. Sampling and Analysis of Non-Hazardous Contaminated Material. City staff and the Engineer shall be notified of excavation in the identified area of concern. Should the city determine that the materials being excavated potentially contain non- hazardous contaminated material, the Contractor shall excavate soils in the area, stock pile materials and/or leave the materials in-situ, as directed by the Engineer.

During the period following excavation and stockpiling, and prior to loading and removal of the soils, the Contractor will be directed to proceed with work in other areas of the project, should other areas be available for work within the project area and in compliance with the project schedule and Progress Clause. Any downtime related to the discovery, excavation, stockpiling, testing, loading and hauling of the non-hazardous contaminated material will not be paid for separately.

The City will be responsible for the costs associated with testing of the soils to determine the nature and extent of the contamination. Reports related to any testing will be provided to the Contractor.

The information contained in this report shall be utilized to secure a Type II disposal facility for disposal of the non-hazardous contaminated material. The contractor shall be responsible for preparing any forms or applications required by the disposal facility prior to their acceptance of the non-hazardous contaminated material for disposal.

The contractor shall also be responsible for familiarizing themselves with the information contained in the report and adjusting their operations accordingly to meet the safety and health requirements as set forth in Section 104.07.B of the MDOT 2020 Standard Specifications for Construction.

f. **Disposal of Non-Hazardous Contaminated Material.** Disposal of non- hazardous contaminated material shall be at a licensed Type II sanitary landfill. The Contractor shall submit at the preconstruction meeting the name of the Type II landfill to be used for disposal, the sampling and analysis requirements of the landfill, and verification that the use of the proposed landfill will meet the requirements of the County solid waste plan.

g. **Measurement and Payment.** The completed work as described will be paid for at the contract unit price for the following contract item (pay item):

PAY ITEM	**PAY UNIT**
Non-Hazardous Contaminated Material Handling and Disposal (LM)	Cubic Yard

Non-Hazardous Contaminated Material Handling and Disposal will be measured by volume in cubic yards, loose measure, as contained in the hauling unit. Under no circumstance will the Contractor be paid for quantities of this material that have not been approved for payment by the Engineer and as measured and tracked by the Engineer and the Contractor. The Contractor will not be paid "standard amounts" that have been determined by the disposal facility; only measured volumes as computed by the Engineer will be paid. Prior to payment, the Engineer shall be given receipts from the disposal facility for the number of cubic yards disposed of at that facility. Payment

shall include all costs for materials, labor and equipment needed for storage, loading, transportation, and disposal of the non-hazardous contaminated material. Disposal costs shall include all documentation required by the landfill. Payment for this item shall be the same, regardless of whether or not the Contractor temporarily stores the contaminated material; the Contractor shall not be paid for re-handling of the material due to construction staging, stockpiling, or other related activities.

Payment for excavation of non-hazardous contaminated materials shall be included with the related items of work.

DESCRIPTION

The Contractor shall furnish, place, maintain, and remove soil erosion and sedimentation control measures, including but not limited to, silt fence and fabric filter protection at all drainage structures, all in accordance with all applicable City (and other governmental agencies) codes and standards, as directed by the Engineer, as detailed in the Standard Specifications, and as shown on the Plans.

This work consists of installing and maintaining inlet filters and silt fence in accordance with Section 208 of the 2012 Michigan Department of Transportation Standard Specifications for Construction and as shown on the plans. Filters in existing and proposed inlets, as well as silt fence downstream of construction area, shall be installed in order to minimize the erosion of soil and the sedimentation of water courses. The related work includes the installation, maintenance, and removal of the filters and fence, cleaning as required during the performance of the project work, removing and disposing of accumulated sediment, and replacement of filters if required by the Engineer so as to provide a properly working inlet filter and a well-drained site.

MATERIALS

The inlet protection filters shall be in accordance with the REGULAR FLOW SILTSACK® manufactured by ACF Environmental (800) 448-3636; FLEXSTORM® Style FX manufactured by Advanced Drainage Systems, Inc. (800) 821-6710; CATCH-ALL® manufactured by Price & Company (866) 960-4300, SLOT GUARD® manufactured by Ertec Environmental Systems (866) 521-0724, or Engineer approved equal.

The Contractor shall submit product data sheets and a sample of the filter material for inlet filters and silt fence for Engineer approval prior to ordering materials.

METHODS OF CONSTRUCTION

The Contractor shall install, maintain, clean, and re-install and/or replace inlet filters and silt fence in accordance with the manufacturer's specifications and as directed by the Engineer. The Contractor shall dispose of debris off-site.

MEASUREMENT AND PAYMENT

Soil erosion and sedimentation control items shall be field measured and paid for at the Contract Unit Prices for their respective Contract (Pay) Items as follows:

PAY ITEM	PAY UNIT
Erosion Control, Inlet Protection	Each
Erosion Control, Silt Fence	Foot

The unit prices for these items of work shall include all labor, material, and equipment costs to perform all the work specified in the Standard Specifications and as modified by this Detailed Specification.

CITY OF ANN ARBOR SPECIAL PROVISION FOR
AGGREGATE BASE COURSE, 21AA, MODIFIED

DLZ:LCM 09/16/22

a. Description. - This work shall consist of constructing aggregate base courses, on either a prepared subgrade or subbase as indicated on the Plans or where directed by the Engineer. This work shall be performed in accordance with Sections 301, 302, and 307 of the 2020 MDOT Standard Specification for Construction except as specified herein.

b. Materials. - The material used for this work shall meet the requirements of Sections 301, 302, 307, and 902 of MDOT 2020 Standard Specification for Construction, except that the aggregate base shall be either 21AA limestone (permanent and temporary applications) with a maximum loss by washing of 8%.

c. Construction Method. - Aggregate base courses shall not be placed when there are indications that the mixture may become frozen before the maximum unit weight is obtained, and in no case shall they be placed on a frozen subbase or subgrade.

The subbase and subgrade shall be shaped to the crown and grade specified on the plans and maintained in a smooth condition. The top of the subbase shall be placed to within ½ inch below and ½ inch above plan grade. The top of the aggregate base shall be placed to within ½ inch below and ¼ inch above plan grade. Variations within this tolerance shall be gradual. If in the opinion of the Engineer, the Contractor's equipment is causing or will cause any ruts in or damage to the subbase or subgrade, the equipment shall not be permitted on the subbase or subgrade.

Should the subgrade, subbase or aggregate base become damaged due to the Contractor's equipment or by local traffic, the subgrade, subbase, or aggregate base course shall be restored to the condition required by the Specifications without additional compensation to the Contractor.

No pavement course, concrete curb and gutter, or concrete driveway opening shall be placed until the subbase has been compacted to not less than 95 percent, and aggregate base course to not less than 98 percent of their respective maximum dry densities and until a "Permit to Place" has been issued by the Engineer.

Base course aggregate shall be handled and/or stockpiled on-site in a manner that minimizes segregation. Base course aggregate shall be deposited from trucks or through a spreader in a manner that will minimize segregation of material and that is approved by the Engineer. The re-handling of base course aggregate by the Contractor will not be considered sufficient cause to allow the material to become segregated. The Contractor may be required to wet the materials prior to and/or during placement to minimize segregation and to aid in compaction of the material should it be necessary.

All structures, including manholes, valve boxes, inlet structures and curbs shall be protected from damage and contamination by debris and construction materials. Structures shall be maintained clean of construction debris and properly covered at all times during the construction.

The Contractor may be charged for the cleaning by others of accumulated construction debris in the utility structures, and damages resulting from the uncleaned structures.

d. Measurement and Payment. - The completed work as measured will be paid for at the contract unit prices for the following contract items (pay items):

Pay Item	**Pay Unit**
Aggregate Base Course, 21AA, Modified	Cubic Yard

"Aggregate Base Course, 21AA, Modified" will be measured in cubic yards based on plan installation. The item of work will be paid for at the contract unit price, which shall be payment in full for all labor, material and equipment needed to accomplish this work.

The provisions of Section 306.04 regarding excess moisture content, moisture corrections, and pay weights shall apply to this item of work.

CITY OF ANN ARBOR SPECIAL PROVISION FOR
SAND SUBBASE COURSE, 21AA, CIP

a. DESCRIPTION - This work shall consist of constructing an aggregate subbase on an existing aggregate surface, or on a prepared subgrade in accordance with Sections 301, 302 and 307 of the 2020 MDOT Standard Specifications for Construction, except as specified herein.

b. MATERIAL - The materials used for this work shall be MDOT Class II granular material meeting the requirements of the City Standard Specifications.

c. CONSTRUCTION METHOD - Sand or aggregate courses shall not be placed if, in the opinion of the Engineer, there are any indications that they may become frozen before their specified densities are obtained.

Sand or aggregate courses shall not be placed on a frozen base, subbase or subgrade.

The Contractor shall not use rubber-tired equipment on the grade, when its use causes, or may cause, in the opinion of the Engineer, damage to the grade. The Contractor shall conduct his/her operation(s), and provide all necessary equipment, to ensure the satisfactory completion of the work without damaging the grade. This includes the transporting, stockpiling, re-handling, and movement of materials over additional distances, in lieu of driving on an unprotected, or partially unprotected, grade.

The Contractor is solely responsible for the maintenance and protection of the grade. Further, any damage to the grade which, in the opinion of the Engineer, is caused as a result of the Contractor's operation(s), or his/her subcontractors' or suppliers' operation(s), shall be repaired by the Contractor at the Contractor's expense. This includes any additional earthwork and/or maintenance materials as directed by the Engineer, for the purposes of the Contractor's maintenance and protection of the grade.

The Contractor shall shape the base, subbase and subgrade to the elevations, crowns, and grades as specified on the Plans and as directed by the Engineer. This may include re-grading the subbase to provide different crown grades than those existing prior to the construction.

The Contractor shall remove, add to, re-shape, re-grade, and re-compact the existing roadbed materials (including the base bed under sidewalks), and shall construct the roadway and sidewalks to the cross- section(s) as indicated on the Plans, as detailed in the Specifications, and as directed by the Engineer. The Contractor shall use blade graders, maintainers, vibratory rollers, and/or other equipment as necessary, and as directed by the Engineer, for this work. Use of each specific piece of equipment is subject to the approval of the Engineer.

The Contractor shall maintain the base, subbase, and subgrade in a smooth, well drained condition at all times.

Sand and aggregate courses shall be placed in uniform layers such that when compacted, they have the

thicknesses shown on the Plans, or as directed by the Engineer. The loose measure of any layer shall not be more than 9-inches nor less than 4-inches.

Sand subbase and aggregate base courses shall be compacted to not less than 98% of their respective maximum unit weights, as determined by the AASHTO T-180 test.

All granular materials shall be deposited from trucks or through a spreader in a manner that will minimize segregation of material.

Manholes, valve boxes, inlet structures and curbs shall be protected from damage. Manholes & inlet structures shall be continuously cleaned of construction debris and properly covered at all times during the construction. Upon completion of each day's work, manholes, water valve boxes, inlets and catch basins shall be thoroughly cleaned of all extraneous material.

d. MEASUREMENT AND PAYMENT - Where granular materials are used as base, as subbase, or as fill for excavations in Machine Grading areas, item of work "Sand Subbase Course CL II " shall be measured and paid accordingly.

The completed work as measured for these items of work will be paid for at the Contract Unit Prices for the following Contract (Pay) Items:

PAY ITEM	**PAY UNIT**
Sand Subbase Course Class II	Cubic Yard

The unit prices for these items of work shall include all labor, material, and equipment costs to perform all the work specified in the Standard Specifications and as modified by this Detailed Specification.

CITY OF ANN ARBOR SPECIAL
PROVISION FOR
COLD MILLING, HMA SURFACE, MODIFIED

DLZ:LCM 1 of 1 09/16/22

a. Description. This work consists of cold milling the existing pavement, repairing areas of failed asphalt pavement, and/or placing new hot mix asphalt (HMA) material as directed by the Engineer and as described herein. Complete pavement repairs in the cold milled surface prior to placement of the first hot mix asphalt paving course.

b. Materials. Provide materials in accordance with subsection 501.02 of the MDOT 2020 Standard Specifications for Construction, detailed specifications and as shown on the plans.

c. Construction. Cold mill designated areas, repair pavement in locations as specified by the Engineer, and place "Hand Patching, Modified", in accordance with the details on the plans and according to subsection 501.03 of the MDOT 2020 Standard Specifications for Construction. The Engineer will designate repair locations after the pavement has been cold milled as shown on the plans. The milling machine must return to the designated repair locations to mill an additional depth of 3 inches. "Hand Patching, Modified" must be placed in the repair area and roller compacted prior to placement of the paving course.

d. Measurement and Payment. Measure and pay for the completed work, as described, at the respective contract unit prices using the following respective pay items:

Pay Item	**Pay Unit**
Item 250-02: Cold Milling HMA Surface, Modified	Square Yard

Measure **Cold Milling HMA Surface, Modified** area by the unit square yard and pay for it at the contract unit price, which price includes the cost for all labor, equipment and materials required to mill, perform multiple mill passes, re-mill, and remove, load, haul, and dispose of the cold milled material, and cleaning the cold milled pavement. The Engineer will not pay for material picked up by cleaning after cold milling.

CITY OF ANN ARBOR SPECIAL
PROVISION FOR
HMA, 3EML HMA,
5EML
HAND PATCHING, MODIFIED

DLZ:LCM 1 of 4 09/16/22

a. DESCRIPTION - This work shall consist of constructing HMA pavement base, leveling, and wearing courses, and hand patching, in accordance with Division 5 and Section 501 of the 2020 MDOT Standard Specifications, current supplemental MDOT specifications, and the City Standard Specifications, except as modified herein, and as directed by the Engineer.

b. MATERIALS

General - The HMA mixtures to be used for this work shall be as follows:

WORK ITEM	**THICKNESS**	**MDOT HMA MIXTURE #**
HMA Pavement Wearing	2.0"	5EML
HMA Pavement Leveling	3.0"	3EML
HMA Pavement Base Course	3.0"	3EML
Hand Patching (Permanent)	3"	3EML
Hand Patching (Temporary)	as directed	see note

Binders for the bituminous mixes shall be PG 64-28 or as directed by the Engineer and shall meet the requirements specified in Section 904 of the 2020 MDOT Standard Specifications, and any current supplemental MDOT specifications.

Bond coat shall be an emulsified asphalt Type SS-1h and shall meet the requirements specified in Section 904 of the 2020 MDOT Standard Specifications, and any current supplemental MDOT specifications.

The use of Marshall Mixes and Cold Patch will be acceptable for use in Hand Patching for areas identified as temporary pavement, at the approval of the Engineer.

The Aggregate Wear Index (AWI) number for this project is 260. This AWI number applies to all aggregates used in all top course mixtures. Blending aggregates to achieve this AWI requirement is permitted in accordance with current MDOT Standards, and Supplemental Specifications.

Recycled Asphalt Pavement (RAP) in HMA Mixtures - The use of Recycled Asphalt Pavement (RAP) in HMA mixtures shall be in accordance with Section 501.
02. A. 2 of the 2012 MDOT Standard Specifications, and the City of Ann Arbor Standard Specifications.

c. CONSTRUCTION METHODS - All concrete work shall be completed prior to placing HMA mixtures.

The Contractor shall have a 10-foot long straight-edge, backhoe, air-compressor and jackhammer available during all paving operations.

Prior to placing the bond coat, the Contractor shall kill all vegetation (within the area to be paved) by applying an approved weed killer ("Round-Up" by Monsanto, or equal), shall thoroughly clean all joints & cracks in the existing pavement (and any gutter to be overlaid) with compressed air and/or vacuum-type street cleaning equipment to remove all dirt and debris to a depth of at least 1-inch, and shall thoroughly clean the entire surface to be paved, with a Vac-All or similar vacuum-type street cleaning equipment.

MDOT SS-1h bond coat shall be applied at a uniform rate of 0.10 gallons/square yard, on all exposed, existing HMA and concrete surfaces which will come in contact with the new HMA material. The Contractor shall take extra care to avoid covering surfaces which are not to be paved. After September 15, SS-1h bond coat shall not be diluted by more than 25%.

The Contractor shall place HMA wedges using the base, leveling, and wearing mixtures specified herein, as directed by the Engineer, prior to placing the wearing course. Such wedging shall be measured and paid for at the respective unit price of the appropriate HMA Pavement item.

Construction of butt joints, where directed by the Engineer, shall be measured and paid for as "Machine Grading Modified."

The Contractor shall construct the pavement courses to provide the final cross-slopes (crowns) specified by the Engineer.

The Contractor shall construct feather joints, and shall feather the leveling and wearing courses at structures, in drive approaches, and at intersection joints, as directed by the Engineer. Feather joints shall vary the thickness of the asphalt from 0.0-inches to the required full paving thickness (approximately 1½-inches) over a 5-foot to 15-foot distance, or as directed by the Engineer. The Contractor shall rake all large aggregates out of the HMA mixture in feather joints, prior to compaction.

The Contractor shall provide a minimum of two rakers during the placement of all wearing and leveling courses. Further, the Contractor shall provide, when directed by the Engineer, a second "Break-Down" roller in order to achieve the specified asphalt densities.

The Contractor shall provide a minimum of 24-hours' notice to the Engineer prior to paving and shall obtain a "Permit To Pave" from the Engineer in advance of scheduling paving.

The Contractor and Engineer shall carefully observe the paving operation for signs of faulty mixtures. Points of weakness in the surface shall be removed or corrected by the Contractor, at his/her expense, prior to paving subsequent lifts of HMA material. Such corrective action may

include the removal and replacement of thin or contaminated sections of pavement, including sections that are weak or unstable. Once the Contractor or his representative is notified by the Engineer that the material being placed is out of allowable tolerances, or there is a problem with the paving operation, the Contractor shall stop the paving operation at once, and shall not be permitted to continue placing HMA material until again authorized by the Engineer. Substandard work that, in the Engineer's opinion, requires removal and replacement, shall be completed as follows:

1. Remove and replace leveling and/or wearing course areas mixed with foreign materials and defective areas.
2. Sawcut full depth of existing pavement in perpendicular and parallel directions to adjoining surfaces to ensure a quality and aesthetically pleasing repair.
3. Replacement may need to extend beyond the area of repair. Cut out such areas and fill with fresh, hot mix asphalt.
4. Compact by rolling to specified density and smoothness.
5. Sawcut or route new joint and fill with specified Hot Poured Rubber Joint Sealer product.

During the placement of leveling and wearing courses, the speed of the paving machine(s) shall not exceed 50-feet per minute.

The Contractor shall furnish and operate enough materials and equipment so as to keep the paving machine(s) moving continuously at all times. Failure to do so shall be cause for the suspension of the paving operation until the Contractor can demonstrate to the satisfaction of the Engineer, that sufficient resources have been dedicated to perform the work in accordance with the specifications.

Each layer of HMA mixture shall be compacted to between 92 to 96 percent (or as determined acceptable by the Engineer) of the theoretical maximum density, as listed on the approved Job Mix Formula.

d. MEASUREMENT AND PAYMENT - Measurement of these HMA paving items shall be by the ton, in place. Unused portions of material loads shall be returned to the plant and re-weighed, and the corrected weight slip shall be provided to the Engineer. All weight slips must include the type of mixture (codes are not acceptable), as well as vehicle number, gross weight, tare weight and net weight.

The bond coat is included in the cost of the HMA Pavement Item.

Corrective action shall be enforced as described at Division 5 of the 2020 MDOT Standard Specifications and will be based on the City's or DDA's testing reports.

All costs for furnishing and operating vacuum-type street cleaning equipment, backhoes, jackhammers, and air compressors shall be included in the bid prices for these items of work or in the item of work "General Conditions."

The completed work as measured for these items of work will be paid for at the Contract Unit Prices for the following Contract (Pay) Items:

PAY ITEM	**PAY UNIT**
All HMA Pavement Items	Ton

The unit prices for these items of work shall include all labor, material, and equipment costs to perform all the work specified in the Standard Specifications and as modified by this detailed Specification.

Payment Adjustment In Lieu Of Repair/Replacement - In the case that the work that is installed does not meet the specified quality of materials or installation, the DDA may opt to require the full removal and replacement of the substandard work, or, at their discretion, use the formulas listed below to reduce payment for the work.

A. Pavement Compaction:
   1. Pavement
      a. If the daily average in place density is less than 94%, but greater than 93% of the mixture theoretical maximum density (TMD) the paving will be evaluated by the Engineer and Owner and at Owner's discretion, the unit price of that days paving will be reduced to 90% of full payment.
      b. If the daily average in place density is less than 93% but greater than 92% of the mixture TMD the paving will be evaluated by the Engineer and Owner and at Owner's discretion may either be removed or the unit price of that days paving will be reduced to 75% of full payment.
      c. If the daily average in place density is less than 92% of the mixture TMD the paving will be removed and replaced at no cost to Owner.

CITY OF ANN ARBOR SPECIAL
PROVISION FOR
CURB AND GUTTER, CONC, ANY TYPE CONCRETE SIDEWALK, 6 INCH CONCRETE SIDEWALK, 8 INCH SIDEWALK RAMP, CONCRETE, 8 INCH

a. **DESCRIPTION -** This work shall consist of constructing concrete items including concrete curb, gutter, curb and gutter, sidewalks, road concrete pavement base and crosswalks, steel reinforcement, mechanical anchors and hook bolts, all of any type and/or dimensions, all of either regular, fibermesh reinforced, and/or high-early concrete, in accordance with Sections 601, 602, 603, 802, and 803 of the 2020 MDOT Standard Specifications for Construction, except as specified herein, as shown on the Plans, as shown in this Detailed Specification, and as directed by the Engineer.

The Contractor is responsible to construct all sidewalks, sidewalk ramps, drives, curbs, and all other concrete items within ADAAG compliance. All sidewalks and curb ramps must be constructed in accordance with MDOT Standard Detail R-28-J (version in place at time of the bid letting).

b. **MATERIALS -** Refer to the Detailed Specification for Concrete Durability for additional requirements.

Concrete mixtures shall be as follows (or as directed by the Engineer), and concrete materials shall meet the requirements specified in the referenced sections of the MDOT Standard Specifications:

Concrete Item	Concrete Mixture	MDOT Section
Curb & Gutter	P-NC, P1, 6-sack	601
6” or 8” Sidewalk, Road, and RampType 1	Fibermesh Reinforced P1, 6 sack	601
	Fibermesh Reinforced P-NC Fibermesh Reinforced P-NC	

Fibermesh reinforced concrete shall have a polypropylene fibrillated fibers added at a rate of 1.5 pounds per cubic yard. The fibers shall meet the requirements of ASTM C116-89 “Specification for Fiber Reinforced Concrete and Shotcrete” Classification 4.1.3 Type III. The concrete shall be thoroughly mixed for a minimum of 5 minutes after the addition of the fibers to assure uniform distribution throughout the concrete.

CONSTRUCTION METHODS

General - Concrete items, including sidewalk, road pavement, non-integral curb/gutter, drives, and structure adjustments shall be completed prior to the placement of bituminous asphalt pavement. All subgrade work shall be completed prior to placing concrete items, unless directed or approved by the Engineer.

The subbase shall be trimmed to final elevation before placing curb. Curb shall not be placed on a pedestal or mound.

The Contractor is responsible for any damage to concrete items, including but not limited to vandalism; vehicular, pedestrian and/or miscellaneous structural damage; surface texture damage; and rain damage. Such damaged work will be removed and replaced at no additional cost.

The Contractor shall maintain on-site at all times, a sufficient quantity of adequate materials to protect concrete items. The Engineer may suspend or defer concrete placement if rain protection is not available. The Contractor shall not be entitled to any additional compensation due to work suspension or deferral resulting from a lack of adequate rain protection.

The subbase and adjacent concrete shall be sufficiently wet-down with water prior to placing concrete, to prevent water loss from the new concrete, and to form a better bond between old and new concrete. If a cold-joint becomes necessary, (the) existing concrete surface(s) shall be cleaned with compressed air to expose the aggregate in the concrete.

Where concrete items are placed adjacent to existing pavement that is within areas scheduled for subsequent pavement removal and/or milling, the adjacent pavement area shall, within 48-hours of the removal of concrete formwork, be backfilled with MDOT 21AA, Modified aggregate compacted in place to 95% up to the elevation of the bottom of the adjacent pavement and paid for as "Aggregate Base Course - 21AA - C.I.P."

Prior to compacting backfill in front of curb and gutter, the back of curb shall be backfilled with approved material and compacted by mechanical means to 95%.

Concrete surfaces are to have the finishes noted on the plans. Where no finish is noted, a Light Broom finish perpendicular to the street (for sidewalks), and a Medium Broom finish perpendicular to the street for the Concrete Crosswalks.

Reinforcement - All steel reinforcement, mechanical anchors and hook bolts, dowels, and all of any type and/or dimensions shall be provided and installed per the Engineer and plans. All costs associated with reinforcement, anchors, and hook bolts is considered incidental to the concrete work.

Pavements shall utilize fiber mesh reinforcing, made of 100 percent virgin homopolymer polypropylene graded multifilament fiber. Blend with concreate mix at the rate specified by the manufacturer for the depth of pavements and concrete mix specified.

Control Joints - Control joints shall be as located and detailed on the plans. The method of forming joints and spacing shall be approved by the Engineer prior to construction. Joints shall be evenly spaced, forming the pattern indicated on plans, and shall be perpendicular to the building face or curb line unless otherwise directed by the engineer.

Expansion Joints - ¾-inch wide expansion joints shall be placed through concrete pavements in

line with the extension of all property lines or at the longitudinal ends of each block as directed by Engineer; at all expansion joints in the abutting curb, gutter, and combination curb and gutter, and as directed by the Engineer. Transverse expansion joints shall be placed through the sidewalks at uniform intervals of not more than 300- feet, or at a minimum, the center of each block.

½-inch wide expansion joints shall be placed between the sidewalk and road pavement and abutting curb or gutter, at the juncture of two sidewalks, between the sidewalk and buildings and other rigid structures, and as directed by the Engineer.

Expansion Joints in Curb and Gutter - ¾-inch wide expansion joints shall be placed at all street returns, at all expansion joints in an abutting pavement, at each side of all driveways (at radius points), elsewhere at 300-foot maximum intervals, and as directed by the Engineer.

Expansion joint material shall extend to the full depth of the joint. After installation, the top shall not be above the concrete nor be more than ½-inch below it. No reinforcing steel shall extend through expansion joints.

Plane of Weakness Joints in Curb and Gutter - Intermediate plane of weakness joints shall be placed to divide the structure into uniform sections, normally 10-feet in length, with a minimum being 8- feet in length, and shall be placed opposite all plane of weakness joints in the abutting concrete base course.

Plane of weakness joints shall be formed by narrow divider plates, which shall extend 3- inches into the exposed surfaces of the curb or curb and gutter. Plates shall be notched, if necessary, to permit the steel reinforcement to be continuous through the joint.

Project Mock-Up - Prior to concrete work commencing, the contractor will coordinate a review meeting with the Engineer and consultant team to discuss jointing details and layout, finishes, and logistics of the pour. Further, the Contractor will coordinate with the Engineer and consultant team so that the appropriate owner's representatives can observe the initial concrete pouring, jointing, and finishing for each concrete pavement and curb type to review and approve the work. These initial concrete installations will act as project mockups which the remaining work shall match in finishing, jointing, and quality.

C. MEASUREMENT AND PAYMENT - The work of furnishing and installing mechanical anchors and hook bolts will be considered incidental to the work item.

A deduction in length for catch basins and inlet castings will be made to measurements of Curb and Gutter. Curb and Gutter, Any Type, shall be measured at the center of the curb and gutter cross section.

All miscellaneous hand work is considered included in the pay items of work and shall not be paid for separately.

Completed work as measured for these items of work will be paid for at Contract Unit Price for the following Contract (Pay) Items:

PAY ITEMS	**PAY UNIT**
Curb and Gutter, Conc, 18 Inch, Ay Type	Linear Foot
Curb and Gutter, Conc, 24 Inch, Any Type	Linear Foot
Concrete Sidewalk, 6 Inch	Square Foot
Sidewalk Ramp, 8 Inch	Square Foot

The unit prices for these items of work shall include all labor, material, and equipment costs to perform all the work specified in the Standard Specifications and as modified by this Detailed Specification.

CITY OF ANN ARBOR SPECIAL
PROVISION FOR
DETECTABLE WARNING SURFACE

DLZ:LCM 1 of 2 09/16/22

a. DESCRIPTION - This work shall consist of furnishing and installing cast in place detectable warning units in compliance to the Americans with Disability Act (ADA). All work shall be in accordance with MDOT Standard Detail R- 28 (version in place at time of the bid letting).

b. MATERIALS AND CONSTRUCTION METHODS - The detectable warning tiles shall be ceramic cement or composite polymer concrete (CRC), colored as Federal Number 22144 (frequently referred to as "Colonial Red" or "Brick Red"). The detectable warning tiles shall meet the following dimensions and tolerances:

1. Dimensions: Cast In Place Detectable/tactile Warning Surface Tiles shall be held within the following dimensions and tolerances:
    i. Length: 24"
    ii. Width: The full width of the approaching walk (60" or typical sidewalk), or as indicated on plans.
    iii. Depth: 1.375 (1-3/8") (+/-) 5% max.
    iv. Face Thickness: 0.1875 (3/16") (+/-) 5% max. Warpage of Edge: 0.5% max. Embedment Flange Spacing: shall be no greater than 3.1"
2. Water Absorption of Tile when tested by ASTM D 570-98 not to exceed 0.05%.
3. Slip Resistance of Tile when tested by ASTM C 1028-96 the combined Wet and Dry Static Co-Efficient of Friction not to be less than 0.80 on top of domes and field area.
4. Compressive Strength of Tile when tested by ASTM D 695-02a not to be less than 28,000 psi.
5. Tensile Strength of Tile when tested by ASTM D 638-03 not to be less than 19,000 psi.
6. Flexural Strength of Tile when tested by ASTM D 790-03 not to be less than 25,000 psi.
7. Chemical Stain Resistance of Tile when tested by ASTM D 543-95 (re approved 2001) to withstand without discoloration or staining - 10% hydrochloric acid, urine, saturated calcium chloride, black stamp pad ink, chewing gum, red aerosol paint, 10% ammonium hydroxide, 1% soap solution, turpentine, Urea 5%, diesel fuel and motor oil.
8. Abrasive Wear of Tile when tested by BYK - Gardner Tester ASTM D 2486-00 with reciprocating linear motion of 37± cycles per minute over a 10" travel. The abrasive medium, a 40 grit Norton Metallite sandpaper, to be fixed and leveled to a holder. The combined mass of the sled, weight and wood block is to be 3. 2 lb. Average wear depth shall not exceed 0.060 after 1000 abrasion cycles when measured on the top surface of the dome representing the average of three measurement locations per sample.
9. Resistance to Wear of Unglazed Ceramic Tile by Taber Abrasion per ASTM C501-84 (re approved 2002) shall not be less than 500.
10. Fire Resistance of Tile when tested to ASTM E 84-05 flame spread shall be less than 15.
11. Gardner Impact to Geometry "GE" of the standard when tested by ASTM D 5420-04 to have a mean failure energy expressed as a function of specimen thickness of not less than 550 in. lbf/in. A failure is noted when a crack is visible on either surface or when any brittle splitting is observed on the bottom plaque in the specimen.
12. Accelerated Weathering of Tile when tested by ASTM G 155-05a for 3000 hours shall exhibit the following result –E<4.5, as well as no deterioration, fading or chalking of surface.
13. Accelerated Aging and Freeze Thaw Test of Tile and Adhesive System when tested to ASTM D 1037-99 shall show no evidence of cracking, delamination, warpage, checking, blistering, color change, loosening of tiles or other detrimental defects.

14. Salt and Spray Performance of Tile when tested to ASTM B 117-03 not to show any deterioration or other defects after 200 hours of exposure.
15. AASHTO HB-17 single wheel HS20-44 loading "Standard Specifications for Highways and Bridges". The Cast In Place Tile shall be mounted on a concrete platform with a ½" airspace at the underside of the tile top plate then subjected to the specified maximum load of 10,400 lbs., corresponding to an 8000 lb individual wheel load and a 30% impact factor. The tile shall exhibit no visible damage at the maximum load of 10,400 lbs.
16. Embedment flange spacing shall be no greater than 3.1" center to center spacing as illustrated on the product Cast In Place drawing.

c. CONSTRUCTION METHODS - The contractor shall follow manufacturer specifications for installation, except where they conflict with MDOT Standard Detail R-28-J (version in place at time of the bid letting).

d. MEASUREMENT AND PAYMENT - The completed work as measured for this item of work will be paid for at the Contract Unit Prices for the following Contract (Pay) Item:

PAY ITEM	**PAY UNIT**
Detectable Warning Surface	Square Foot

The unit price for this item of work shall include all labor, material, and equipment costs to perform all the work specified in the Standard Specifications and as modified by this Detailed Specification.

CITY OF ANN ARBOR SPECIAL
PROVISION FOR
RECESSING PAVT MRKG, LONGITUDINAL RECESSING
PAVT MRKG, TRANSVERSE

DLZ:LCM 1 of 2 09/16/22

a. **DESCRIPTION -** This work consists of providing all equipment and labor required to prepare (grooving) the pavement surface for recessed longitudinal, transverse, and turning guideline pavement markings in accordance with the City of Ann Arbor Permanent Pavement Markings Detailed Specification, the plans, and this detailed specification.

b. **MATERIALS -** None specified.

c. **CONSTRUCTION -** Install a recess (groove) in accordance with the recessed pavement marking material manufacturer's installation instructions. Ensure all recessing configurations are in accordance with the Michigan Manual of Uniform Traffic Control Devices and the Michigan Department of Transportation Pavement Marking Standards.

Grooving Concrete and Hot Mix Asphalt Pavement. If there are no markings on the pavement, paint a temporary tracer line (with no beads) exactly where the permanent markings will be placed. Use these lines as a template for the grooving operation.

a. Use equipment and methods approved by the manufacturer of the recessed pavement marking material to be recessed for forming grooves in pavement surfaces. Dry cut the grooves in a single pass using stacked diamond cutting heads on self-vacuuming equipment capable of producing a finished groove ready for pavement marking material installation.

b. Ensure that the bottom of the groove has a fine corduroy finish. If a coarse tooth pattern results, increase the number of blades and decrease the spaces on the cutting head until the required finish is achieved.

Groove Dimensions. Ensure grooves for recessed pavement markings are in accordance with the following:

Longitudinal Markings

Groove Width:	Material width +1 inch, (±1/8 inch)
Groove Depth:	As recommended by the manufacturer, (±5 mils) Groove Position: Center/Lane Lines: 2 inches from joint line, (±1/8 inch) Edge Lines: On lane, 2-4 inches in from the joint line, (±1/8 inch) Edge Lines for 14-foot paved lanes: as directed by the Engineer

Transverse Markings

Groove Width:	Material width +1 inch, (±1/8 inch)

Groove Depth: As recommended by the manufacturer, (±5 mils)
Groove Position: In the exact location where the transverse marking (crosswalk or stop bar) will be placed.

Turning Guideline Markings
Groove Width: Material width +1 inch, (±1/8 inch)
Groove Depth: As recommended by the manufacturer, (±5 mils)
Groove Position: In the exact location where the turning guideline markings will be placed.

Placing Recessed Pavement Markings. Place the pavement marking material in the grooves within 24 hours of the grooves being made. Ensure the grooves are clean and dry prior to placing pavement marking material. Locate the groove so the entire marking can be placed within the groove.

d. MEASUREMENT AND PAYMENT - The completed work, as described, will be measured, and paid for at the contract unit price using the following pay items:

PAY ITEM	PAY UNIT
Recessing Pavt Mrkg, Longitudinal	Linear Foot
Recessing Pavt Mrkg, Transverse	Linear Foot

Pavement marking materials, including retroreflective pavement marking required for traffic control, will be paid for separately using the appropriate pay items.

CITY OF ANN ARBOR SPECIAL
PROVISION FOR
PEDESTRIAN TYPE II BARRICADE, TEMP

DLZ:LCM 1 of 2 09/16/22

a. **Description.** This work consists of furnishing, installing, maintaining, relocating, and removing a temporary pedestrian Type II barricade section as identified in the proposal or on the plans. Use temporary pedestrian Type II barricades to close non- motorized facilities including sidewalks, bicycle paths, pedestrian paths, and shared use paths that are not part of the roadway. One pedestrian Type II barricade is defined as a barricade section at least 43 inches wide, including all supports, ballast, and hardware.

b. **Materials.** Provide a temporary pedestrian Type II barricade that meets the requirements of *National Cooperative Highway Research Program Report 350 (NCHRP 350)* or *Manual for Assessing Safety Hardware* (MASH), in addition to meeting the following requirements:

1. Provide barricade sections at least 43 inches wide, designed to interconnect to ensure a continuous *Americans with Disabilities Act (ADA)* compliant tactile barrier. Ensure the connection includes provisions to accommodate non-linear alignment as well as variations in elevation at the installation area.

2. Ensure the top surface of the barricade is designed to function as a hand- trailing edge, and has a height between 32 and 38 inches. Ensure the lower edge of the barricade is no more than 2 inches above the surface of the non-motorized facility. Ensure the top edge of the bottom rail of the barricade is a minimum of 8 inches above the surface of the non- motorized facility. The barricade may have a solid continuous face. Finally, all features on the front face of the barricade (the face in contact with pedestrians) must share a common vertical plane.

3. Equip both sides of the barricade with bands of alternating 6-inch wide orange and white vertical stripes of reflective sheeting. Two bands of sheeting 6 inches tall and a minimum of 36 inches long containing at least two orange and two white stripes each are required. One band placed near the top and one near the bottom if the barricade section has a solid face. If the barricade consists of two rails, affix one band of sheeting to each rail. Ensure the stripes of reflective sheeting are aligned vertically. Ensure this sheeting meets or exceeds the requirements of *ASTM D 4956* Type IV sheeting.

c. **Construction.** Construct the temporary pedestrian Type II barricade in accordance with the manufacturer's recommendations, Michigan Manual on Uniform Traffic Control Devices (MMUTCD), the plans, and the following requirements:

1. Install the barricade as shown on the plans and as directed by the Engineer. Interconnect all barricade sections using hinge components if necessary to ensure a continuous detectable edge for the entire installation. Ensure the barricade is ballasted according to the manufacturer's recommendations to ensure stability during wind events and contact with pedestrians.

2. When the barricade is installed near motor vehicle traffic, ensure reflective sheeting is visible to motorists.

3. When pedestrian Type II barricades are used to close a non-motorized facility, ensure a sufficient number of barricade sections are used to block the entire width of the facility. The barricade may extend outside the edge of the non-motorized facility but must not be less than the full width of the facility.

4. If sections of multiple colored barriers are used (i.e. safety orange and white) install the sections such that the colors alternate to increase conspicuity.

5. Ensure pedestrian Type II barricades are not used to close a motor vehicle facility. Ensure these barricades are not used to guide pedestrian traffic on a motor vehicle facility in the presence of active traffic. This prohibition includes bicycle/shared use lanes or shoulders in the presence of active traffic.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

Pay Item	**Pay Unit**
Pedestrian Type II Barricade, Temp	Each

Pedestrian Type II Barricade, Temp, includes all labor, equipment, and materials to furnish, install, maintain, relocate, and remove one barricade section that is at least 43 inches wide. Additional payment will not be made if wider sections are provided. This includes all rails, supports, ballast, hinge points, reflective sheeting, and miscellaneous hardware needed to install and maintain a barricade section.

CITY OF ANN ARBOR SPECIAL
PROVISION FOR
SLOPE RESTORATION

AA:DAD 1 of 3 04/09/19

a. Description. This work consists of preparing all manicured lawns and slopes on non- freeway projects designated for slope restoration on the plans or by the Engineer, and applying topsoil, fertilizer, seed, and mulch blankets to those areas. Turf establishment shall be in accordance with section 816 of the Michigan Department of Transportation (MDOT) 2012 Standard Specifications for Construction and Standard Plan Series R-100, except as modified herein or otherwise directed by the Engineer.

b. Materials. The materials and application rates shall meet the requirements specified in subsection 816.02 and section 917 of the MDOT 2012 Standard Specifications for Construction and as specified herein unless otherwise directed by the Engineer.

1. Topsoil Surface: Place 4 inches of topsoil in area disturbed areas designated for restoration. Topsoil shall be free of all stones one inch in diameter or greater.
2. Turf Seed Mixture: Use seed mixture shown in table below. Seed shall be fresh, clean, dry, new-crop seed complying with the AOSA's "Rules for Testing Seed", tested for purity and germination tolerances.

Species/Variety	Mix Proportions (percent by weight)	Purity (percent)	Germination (percent)
Baron Kentucky Bluegrass	25	90	80
Kentucky Bluegrass 98/80	15	98	80
Park Kentucky Bluegrass	15	90	80
Omega III Perennial Ryegrass	20	98	90
Creeping Red Fescue	25	95	90

Maximum weed content shall be 0.30%.

3. Chemical Fertilizer Nutrient: Use Class A fertilizer.
4. Mulch Blanket: Use excelsior mulch blanket free of chemical additives. The netting thread and anchoring devices must be 100 percent biodegradable. **Use no polypropylene or other non-biodegradable netting**. Provide wood or other biodegradable anchors, at least 6 inches in length, as approved by the Engineer. **Do not use steel wire staples or pins to anchor mulch blankets**.

c. Construction. Construction methods shall be in accordance to subsections 816.03 and 817.03 of the MDOT 2012 Standard Specifications for Construction. Begin this work as soon as possible after final grading of the areas designated for slope restoration but no later than the maximum time limitations stated in subsection 208.03 of the Standard Specifications for Construction. It may be necessary, as directed by the Engineer, to place materials by hand.

Restore all areas as shown on the plans and others disturbed by the Contractor's activity(s) and as identified by the Engineer. Slope restoration includes furnishing and placing topsoil, applying seed and fertilizer, placing mulch blankets, and watering as necessary for the establishment of turf.

Prior to placing topsoil, grade, shape, compact and assure all areas to be seeded are weed free. Place topsoil to the minimum depth required, to meet proposed finished grade. Spread and rake topsoil to provide a uniform surface free of large clumps, rocks, brush, roots, or other deleterious materials, as determined by the Engineer. Remove any stones greater than or equal

to 1 inch in diameter. If the area designated for restoration requires more than the minimum depth of topsoil to meet finished grade, the additional depth must be filled using topsoil. Furnishing and placing this additional material is included in this item of work.

Place topsoil that is weed and weed seed free and friable prior to placing seed. Apply seed mixture and fertilizer to prepared soil surface. Incorporate seed into top ½ inch of topsoil.

Use mulch blanket on all areas designated for restoration unless otherwise directed by the Engineer. Install mulch blanket per the manufacturer's published instructions.

Protect and maintain restored areas to establish a uniform, dense, vigorous, and weed free turf without mounds and/or depressions. Begin maintenance immediately upon completion of restoration work and continue up to final acceptance. This includes, but is not limited to, deposition of additional topsoil, re-seeding, fertilizing, and placement of mulch blankets to address areas damaged by washouts and soil erosion, non-uniform germination and bare spots. It also includes any other work required to correct all settlement, erosion, germination, and establishment issues.

If areas washout and/or erode after completing the work and obtaining approval by the Engineer, make the required corrections to prevent future washouts and erosion and replace the topsoil, fertilizer, seed and mulch as required and directed by the Engineer.

Scattered bare spots in seeded areas will not be allowed over three (3) percent of the area nor greater than 6"x 6" in size.

If the Engineer determines weeds cover more than ten percent of the total area of slope restoration, the Contractor will provide weed control in accordance to subsection 816.03.J of the MDOT 2012 Standard Specifications for Construction.

Prior to acceptance, the Engineer will inspect the restored areas to ensure the turf is well established, weed free, in a vigorous growing condition, and contains the species called for in the seeding mixture. If areas do not promote growth, the Contractor will apply new seed, fertilizer and mulch blankets, and water as required.

Upon fulfillment of the above requirements, the Engineer will accept the slope restoration.

Unless otherwise approved by the Engineer, final acceptance will occur no sooner than October 10 of the same year for areas initially restored during the spring (April 15 - June 15) planting season; or, no sooner than June 15 of the following year for areas initially restored during the prior summer/fall (after June 15) planting season.

d. Measurement and Payment. Measure and pay for the completed work, as described, at the contract unit price using the following pay item:

Pay Item	**Pay Unit**
Slope Restoration	Square Yard

Measure **Slope Restoration** area in place by the unit square yard and pay for it at the contract unit price, which price includes the costs for all labor, equipment and materials necessary to complete the work.

The Contractor will restore areas disturbed by its operations and not required by the Project at its own expense.

The Engineer will not pay for any labor, equipment and material costs for the Contractor to provide weed control.

The Contractor will repair and/or clean any damage or soiling to signs, fences, trees, pavements, structures, etc. at its own expense.

After initial placement of the slope restoration measures, the Engineer will certify for payment fifty (50) percent of the total quantity placed for each item. The Engineer will certify for payment the remaining fifty (50) percent of the total quantities upon full establishment and final acceptance of any restored area.

CITY OF ANN ARBOR SPECIAL
PROVISION FOR
ELECTRICAL AND COMMUNICATION HANDHOLES

DLZ:LCM 1 of 2 09/16/22

a. Description. This work shall consist of furnishing and installing handhole assemblies at the locations shown in the Plans, or as directed by the Engineer. All work shall be completed in accordance with the current National Electric Code (NEC), section 818 of the Michigan Department of Transportation (MDOT) 2020 Standard Specifications for Construction, except as specified herein.

The Contractor shall excavate all trenches and pits to the required dimensions; sheet, brace, and properly support the adjoining ground or structures where necessary to comply with MIOSHA, Section 104.07.B of the MDOT 2012 Standard Specifications for Construction, and other relevant safety standards.

The work for all items shall include, but not be limited to; pavement saw-cutting; excavation and disposal of excavated material; the furnishing, installation, and removal of sheeting and/or shoring where needed; all items necessary for the protection of the trench and all persons employed in the work during the work day and "after-hours" periods; the furnishing, placement and compaction of approved bedding and backfill materials; additional labor and equipment costs associated with any required nighttime water main work; and any other required items to complete the work as shown on the plans, as detailed in this Detailed Specification, and as directed by the Engineer.

b. Materials. All materials shall be new and meet the requirements of the current IEEE, NEMA, ANSI Standards as applicable, and as specified herein.

The Contractor shall submit product data sheets for all conduit, handholes, covers and other parts for Engineer approval prior to ordering materials. The manufacturer "Quazite Composolite," referenced below, is located in Lenoir City, Tennessee.

17 inch x 30 inch handhole assemblies shall consist of two, stacked "Quazite" boxes. The box shall be #PG1730BA18. The cover shall be, #PG1730HA46, a locking heavy- duty bolt-down type with a logo that reads "Traffic Signal" or "Street Lighting" based on their intended use. The total depth of the handhole shall be 18 inches.

If directed by Engineer to stack the handholes for additional depth, the model used for the lower box shall be compatible with those specified herein and meet the same strength requirements.

Provide Granular Material, Cl II in accordance with section 902 of the MDOT 2012 Standard Specifications for Construction.

c. Construction. Handholes shall be placed at all junctions of traffic signal or electrical conduit, and as shown on the plans. Maximum distance between any two handholes shall be as shown on the Plans, but in no case shall exceed 500 feet.

Place foundation material consisting of four (4) inches of Granular Material, Cl II compacted to 95% of its maximum unit weight.

Set the handhole or stacked units to the proper depth and elevation.

Connect handholes to new and existing conduits, whether shown on the plans or not. All conduits shall be connected to the handholes in accordance with the latest revision of Article 346 of the National Electrical Code (NEC).
Backfill around the perimeter of the handhole with Granular Material, Cl II compacted to 95% of its maximum unit weight.

Handhole Adjust, Any Size includes the vertical adjustment, either upwards or downwards, of an existing handhole to remain to meet proposed pavement grades and slopes.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit prices for the following pay items:

Pay Item	**Pay Unit**
Handhole Assembly, _____inch x _____inch	Each
Handhole Adjust, Any Size	Each

Handhole Assembly, ___inch x ___inch shall be paid for at their contract unit prices and shall include all labor, equipment, and materials to complete the work as specified herein. The pay item shall also include the excavation and disposal of materials, furnishing, installing and compacting Granular Material, Cl II, and all work related to connecting handholes to new and existing conduits, whether shown or not shown on the plans.

CITY OF ANN ARBOR SPECIAL
PROVISION FOR
STREETLIGHT, REMOVE LUMINAIRE
INSTALLATION POLE INSTALLATION
POLE FIT-UP

DLZ:LCM 1 of 7 09/16/22

a. DESCRIPTION - This work shall include the furnishing, installation and testing of the street lighting fixtures at the locations shown in the plans, and as directed by the Engineer to provide a complete working system ready for use. All work shall be completed in accordance with the National Electric Code (NEC), Section 819 of the Michigan Department of Transportation 2012 Standard Specifications for Construction, the City of Ann Arbor Standard Specifications, and as specified herein.

Any costs associated with the obtaining a permit for the electrical work will be paid for by the Contractor, at no additional expense to the City.

b. MATERIALS - The Contractor shall furnish all materials and equipment required to install and place in operation Street Light Fixtures. All materials shall meet the requirements of the current IEEE, NEMA, ANSI Standards as applicable, MDOT 2020 Standard Specifications for Construction, the City of Ann Arbor Standard Specifications, and as specified herein. All electrical components shall be furnished new and be listed by, and bear the label of Underwriter's Laboratories, Inc.

Street light fixtures shall be installed complete with wiring from the base to the luminaires including pole base fuse holders. Wiring installed in lighting standard poles between luminaires and taps in base shall be copper conductors type "XHHW" No. 10 AWG minimum, in conduit.

Cable and wire shall be manufactured by:

Collyer	Hatfield	Reynolds	
Esses	Kaiser	Rome	
Anaconda	General Cable	Okonite	Southwire
Cerro	General Electric	Phelps Dodge	Triangle

Conductors are to match the sizes of the wires being replaced, unless otherwise specified to be larger herein, or directed by the Engineer.

The connection of conductors from size #12 AWG and larger to terminal parts or other conductors shall be made with heavy-duty cast alloy solderless connectors of the pressure double indent type. Tap connectors at light standards shall be multiple aluminum connector with four positions for #2 AWG copper and a 5th position for #12 AWG or larger fixture wire. Connectors shall be Utilco Catalog No. SLC-4-0-1-L with cover for tap block.

Ground rods shall be copper clad steel, and shall be either two 1/2-inch diameter round by

6-feet long rods, or one 5/8-inch diameter round by 8-feet long rod, as shown on the plans.

Fuse holders shall be watertight, in-line, break-away type, 30A, 600V with insulating boots. Install one fast-acting fuse per phase conductor. Fuses shall be five ampere and/or sized for the fixtures being protected.

Provide 20A, 125VAC NEMA type 5-20R ground fault circuit interrupter (GFCI) receptacle with solid-state ground fault sensing and circuit interrupter Class A, Group 1. Per UL standard 943-2003, manufacturer after January 1, 2003 and five milliamperes ground fault trip level. Receptacles must be rated for outdoor use and meet current code requirements for the intended application.

Pole Fit-Up shall use 2-inch hot dipped galvanized ridged metal conduit and sweep (ERMC- S), rated at 350 pounds per 100 linear feet, in conformance with ANSI C80.1. Hold conduit in place with galvanized steel one-hole strap, rated for heavy duty use for exterior applications. All hardware to be hot dipped galvanized steel.

All fasteners shall consist of stainless steel tamperproof screws, bolts, nuts, washers, etc. All anchor bolts and associated washers, nuts, studs, and couplings shall conform to the requirements of the Michigan Department of Transportation 2012 Standard Specifications for Construction, Section 908.14, and shall be galvanized in accordance with ASTM A-153 or as noted on the Drawings.

Prior to beginning construction, the Contractor shall submit to the Engineer product data sheets and Manufacturer's certifications of all wiring, splices, lamps, rods, base plates, anchor bolts, and other parts used in the construction of the light and pole assembly. Certifications shall indicate that all materials meet the minimum requirements of these specifications.

For each submittal or resubmittal, the Contractor shall allow at least 14 calendar days from the date of the submittal to receive the Engineer's acceptance or request for revisions. The Engineer's comments shall be incorporated into the submitted plans, calculations and descriptions. The Engineer's acceptance is required before beginning the work. Resubmittals shall be reviewed and returned to the General Contractor within 14 calendar days. Required revisions will not be a basis of payment for additional compensation, extra work, or an extension of contract time. The Contractor shall include time for this entire review process in his/her schedule.

C. CONSTRUCTION METHODS - The Contractor shall provide temporary street lighting during the entire construction period, providing the equivalent of half of the current light levels on the street, either through the use of existing streetlights, installed lights as specified, or other temporary equipment and measures.

Remove conduits and wires as indicated in the plans and specifications, and where the

existing wires are replaced by new wires. Unused and unnecessary conduit that is located in undisturbed soils may remain in place.

The Contractor shall provide all labor, materials, tools, equipment, and supervision required for the furnishing and installing of the street lighting fixtures and new GFCI outlets. Connections to equipment, lighting standards, contactors, etc., shall be made in accordance with applicable building and electrical codes and the recommendations from manufacturers of the particular equipment furnished. Any and all additional connections called for by the equipment manufacturer's or otherwise required for the successful operation of the particular equipment furnished shall be installed by the Contractor as part of his Contract with no additional compensation.

The Contractor shall examine all fixtures and poles delivered to jobsite prior to installation to ensure all specification requirements and shop drawing notes & comments have been incorporated by manufacturer. Installation of fixtures signifies Contractor's acceptance and approval of fixtures from manufacturer.

Contractor must provide adequate storage space for all electrical equipment, conduit, and materials delivered to the job site under a weather-protected enclosure. Location of the space must be approved by the Engineer. Equipment set in place in unprotected areas must be provided with temporary protection.

The Contractor shall be responsible for maintenance of, and repair of damage as a result of accident or vandalism to, the light fixtures, bases, luminaries, and all other materials installed, or to be installed, related to, or necessary for the light fixture and pole installation on the project. This shall remain the Contractor's responsibility until the installation is complete, tested, and accepted by the Engineer.

All connections shall be per the manufacturer's recommendation. Where Utilco connections are not used, all joints in outlet or junction boxes shall be taped in such manner that the insulating value of the joint or splice will be at least equal to the insulating value of the conductor to which it is applied.

Wire brush and apply approved corrosion inhibiting compound all connections.

Ground cables shall be #6 AWG, soft drawn, bare, stranded copper wire. Pressure-type connectors shall be used to connect the ground cable to poles and electrical equipment. The cable shall be properly attached to the ground rods.

All fixtures and poles shall be thoroughly and permanently grounded at each location. Grounding shall be in accordance with the latest National Electric Code and as shown on the Drawings, as a minimum. At the disconnect cabinet, the Detroit Edison neutral, the disconnect cabinet, and the ground mat system shall all be permanently grounded together. The

resistance of the ground rod to ground shall not exceed 25 ohms when tested with a megger. In case the resistance is more than 25 ohms, additional or longer ground rods shall be installed.

Install concrete poles foundation where indicated on the drawings. Base of the foundation is to rest on undisturbed subgrade or on 21AA Limestone Aggregate (or pea stone) compacted to not less than 98% of its maximum unit weight. Backfill pole foundation with 21AA Limestone Aggregate (or peas stone) in 6 to 8 inch lifts, compacting each lift as the hole is filled. Precast concrete pole shall be set plumb and in- line with existing poles, with no more than one-half inch deviation from plumb in any direction.

All excavation for main conduit runs shall be of a depth to leave at least 30 inches from the top of the conduit encasement or top of direct buried rigid conduit to grade of top of curb or surrounding terrain. For lateral flexible conduit, the corresponding dimensions shall be 30 inches. The trench shall be graded to handhole and pole location so that the finished conduit run will contain no pockets where water might accumulate or drain into a handhole or pole.

Conduit shall be cut with a hacksaw or other approved tool. The ends shall be square after cutting and the conduit shall be reamed. All conduits must be securely fastened to boxes with locknuts and bushings of an approved make, care being taken that the full number of threads project into the bushings. Rigid galvanized conduit shall be assembled by means of approved threaded galvanized coupling, unions, and fittings. PVC conduit shall be assembled by means of approved threaded or solvent-welded fittings.

Conduits which are installed underground or concealed in concrete, foundations, or other structures, shall be cleared of foreign material and obstructions, after installation and before conductors or pull wire are drawn in, by wire brushing, swabbing and employing an iron or hardwood mandrel which is 1/4"smaller in diameter than the internal diameter of the duct or conduit.

Conduits shall be cut a minimum of 1 inch above the light pole base and not more than 2 inches above the base.

Cable shall be pulled into conduits using a proper cable grip for the purpose. The cable shall be so handled that it is not subjected to excessive strain or kinked when pulled through the conduit. Damaged or kinked cable shall not be used. Where more than one cable is to be installed in a conduit, all cables shall be pulled through simultaneously. Splices in ducts and conduit will not be permitted.

Cables shall be neatly racked and identified on cable racks in all handholes after being formed to their final position. Cables shall be racked slightly higher than the duct entrances so that they will not rest on the edges of the duct. Cables shall be properly tagged in all handholes and poles. All splices and connections shall be made as described herein and as

shown on the details. Where cable is installed but not immediately spliced, the cable ends shall be thoroughly sealed and racked out of the way of possible danger.

Conductors shall not be installed in conduit until all work which might cause damage to the conduits or cables has been completed. Street light conductors shall be installed in continuous lengths from light to light with connections in the base of lights or street light pull boxes. All splices shall be accessible through the pole handhole and shall extend 4”-6” outside the handhole. No splices will be allowed which are inaccessible inside the pole. Street lighting splices required in ground handholes shall be terminated using splice kits that insulate, seal, and protect the splices.

Printed color code phase identification shall be repeated at all connections. The printing of the conductor coding shall be repeated at all connections. The printing of the conductor coding shall adhere to covering and not be readily removed by rubbing.

Where Utilco connections are not used, all joints in outlet or junction boxes shall be taped in such manner that the insulating value of the joint or splice will be at least equal to the insulating value of the conductor to which it is applied.

Pole Fit-Up shall use 2-inch conduit (ERMC-S) from below grade to top of fit up, which is to be 10 feet above grade. Use galvanized ERMC-S sweep and conduit to provide underground feed from fit up to power cabinet. Install threaded conduit fittings between sections pursuant to the NEC. Hold conduit in place on pole with galvanized steel one-hole strap, spaced as need to secure conduit, but not more than 3 feet on center. Secure strap to pole with galvanized lag screws, sized as recommended by manufacturer.

All trenching and backfilling to install electrical work shall be by the Electrical Contractor. When backfilling the trenches under areas to be paved and around street light foundations, the earth must be compacted in place (in 6-8" layers) to 95% of the material’s maximum dry density.

Any excess excavated native material that cannot be placed back into the trench from which it came is to be disposed of as detailed in the special provision entitled “Non Hazardous Contaminated Material”. Any excess excavated fill material placed as part of this project is to be used or “wasted” on site as directed by the Engineer. If it is unable to be incorporated into the final work, at the sole discretion of the Engineer, the excess excavation shall be disposed of offsite at no additional cost.

The use of equipment, or any part thereof, for purposes other than testing, even with the Engineer’s consent, shall not be construed to be an acceptance of the work on the part of the Engineer, nor shall it be construed to obligate the Engineer in any way to accept improper work or defective materials.

Upon completion of the underground work, the Contractor shall grade the work area smooth, filling any trench settlements, eliminating any large piles of earth and cleaning up any debris, or left-over construction materials and disposing of it offsite at an approved manner and location.

All factory finished equipment shall be cleaned at the completion of the work by the Contractor. Equipment showing mars or rust shall be refinished by the Contractor in a manner acceptable to the Engineer.

d. MEASUREMENT AND PAYMENT - The cost of providing temporary street lighting as specified herein shall not be paid for separately.

The completed work shall be paid for at the contract unit price for the following contract items (pay items):

PAY ITEM	PAY UNIT
Streetlight, Remove	Each
Luminaire Installation	Each
Pole Installation	Each
Pole Fit-Up	Each

"Streetlight, Remove" shall be paid for at the Contract unit price each and shall include all labor, equipment, and materials, including, but not limited to excavation of pole foundation, removal of light pole fixture, and attached appurtenances, complete removal of the concrete foundation, and disposal of the light fixtures, poles and attached appurtenances, and backfilling the excavation with MDOT Class II fill, compacted in 6 inch layers to 95 % dry weight density.

"Luminaire Installation" shall be paid for at the Contract unit price each and shall include all labor, equipment, and materials, including, but not limited to luminaries, arms, new wiring from the base of the pole to the fixture and outlet, cable splicing, fittings, supports, hangers, connectors, tape, fuses, grounding equipment; new water proof outdoor rated GFCI outlets, and, any other materials required for complete installation of the light fixture and outlet onto the light pole and its foundation; all required testing; and, placing light fixtures and pole assemblies into service.

"Pole Installation" shall be paid for at the Contract unit price each and shall include all labor, equipment, and materials including, light pole, foundation, setting pole and anchor bolts and backfill. Install the pole such that the handhole is on the opposite side of vehicle traffic (i.e., a person accessing the handhole would be facing the traffic).

"Pole Fit-Up" shall be paid for at the Contract unit price each and shall include all labor,

equipment, and materials, including, but not limited to conduit installed to utility pole, sweeps, underground conduit from pole to power cabinet, hardware, fittings, and all other work and materials to make fit up. Contractor will be considered complete with this pay item once City of Ann Arbor has accepted the fit up for use. This pay item does not include wire, or installation of wire.

a. Description. - This work shall include providing a recording of the physical, structural, and aesthetic conditions of the construction site and adjacent areas as provided herein.

The audio-visual recording shall be:

1. Of professional quality, providing a clear and accurate audio and visual record of existing conditions.
2. Prepared during the three (3) week period immediately prior to the preconstruction meeting.
3. Furnished to the Engineer a minimum of two (2) weeks prior to bringing any materials or equipment within the areas described in this special provision.
4. Furnished to the Engineer either at, or prior to, the preconstruction meeting.
5. Carried-out under the supervision of the Engineer.

The Contractor shall furnish two (2) copies of the completed recording to the Engineer at, or prior to, the preconstruction meeting. An index of the recording, which will enable any area of the project to be easily found on the recording, shall be included. The Contractor shall retain a third copy of the recording for his/her own use.

Any portion of the recording determined by the Engineer to be unacceptable for the documentation of existing conditions shall be recorded again, at the Contractor's sole expense, and submitted to the Engineer prior to mobilizing onto the site.

b. Production. - The audio-visual recording shall be completed in accordance with the following minimum requirements:

1. DVD Format / No Editing. - The audio-visual recording shall be performed using equipment that allows audio and visual information to be recorded simultaneously and in color. The recording shall be provided on compact discs in DVD format. The quality of the recording shall be equal to or better than the standard in the industry. The recording shall not be edited.

2. Perspective / Speed / Pan / Zoom. - To ensure proper perspective, the distance from the ground to the camera lens shall not be less than 12 feet and the recording must proceed in the general direction of travel at a speed not to exceed 48 feet per minute (0.55 miles per hour). Pan and zoom rates shall be controlled sufficiently so that playback will ensure quality of the object viewed.

3. Display. - The recording equipment shall have transparent time, date stamp and digital annotation capabilities. The final copies of the recording shall continuously and simultaneously display the time (hours:minutes:seconds) and the date (month/date/year) in the upper left-hand corner of the frame. Accurate project stationing shall be included in the lower half of the frame in standard station format (i.e., 1+00). Below the stationing periodic information is to be shown, including project name, name of area shown, direction of travel, viewing direction, etc.

   On streets or in areas where there is no project stationing, assumed stationing shall be used, starting with 0+00 and progressing from west to east or from north to south.

4. Audio Commentary / Visual Features. Locations relative to project limits and landmarks must be identified by both audio and video means at intervals no longer than 100 feet along the recording route. Additional audio commentary shall be provided as necessary during the recording to describe streets, buildings, landmarks, and other details, which will enhance the record of existing conditions.

5. Visibility / Ground Cover. - The recording shall be performed during a time of good visibility. The recording shall not be performed during periods of precipitation or when snow, leaves, or other natural debris obstruct the area being recorded.

c. Coverage. - The audio-visual recording coverage shall include the following:

1. General Criteria. - These general criteria shall apply to all recording and shall include all areas where construction activities will take place or where construction vehicles or equipment will be operated or parked and/or where materials will be stored or through which they will be transported. The recording shall extend an additional 50 feet outside of all areas. The recording shall include all significant, existing man-made and natural features such as driveways, sidewalks, utility covers, utility markers, utility poles, other utility features, traffic signal structures and features, public signs, private signs, fences, landscaping, trees, shrubs, other vegetation, and other similar or significant features.

2. Private Property. - Record all private property that may be utilized by the Contractor in conjunction with this project. These project areas must be disclosed by the Contractor prior to using them for the work of this project.

3. Road Construction Area. - The recording coverage shall:
    a. Extend to 50 feet outside of the right-of-way and easements area as shown on the plans.
    b. Extend 50 feet outside the construction limits on all streets, including side streets.

    Both sides of each street shall be recorded separately.

4. Detour Route / Maintenance of Traffic Areas. The entire detour route, if one is provided for on the project plans, and maintenance of traffic areas shall be recorded as indicated in this special provision except as follows:
    a. The recording must proceed in the general direction of travel at a speed not exceeding 176 feet per minute (2 miles per hour).
    b. The coverage area shall include the street and not go beyond the curb except in areas where there is a fair possibility that the detoured traffic will drive over the curb, such as at intersections.
    c. The recording shall focus in particular at sidewalk ramps and other features likely to have been damaged or likely to be damaged as a result of existing traffic, temporary detoured traffic and or construction traffic. In these areas, recording may need to proceed much more slowly.

    Only the side of street with the detoured traffic must be recorded. However, the Contractor is advised that portions of the detour routes may operate in opposite directions at different times. In these cases, both sides of the street shall be recorded separately.

5. Private Property bordering the project limits or work areas. Record all areas bordering the project where work is scheduled to occur or where construction traffic could damage the private property. This is to include buildings, driveways, decks, landscaping, trees, lawns, and all other similar features.

6. Other Areas. - The Contractor shall record at his sole expense other areas where, in his/her opinion, the establishment of a record of existing conditions is warranted. The Contractor shall notify the Engineer in writing of such areas.

The Engineer may direct the recording of other minor areas not specified herein at the Contractor's sole expense.

d. Audio-Visual Recording Services. - The following companies are known to be capable of providing the recording services required by this special provision and shall be utilized unless the Contractor receives prior written approval from the Engineer to utilize another company of comparable or superior qualifications.

Construction Video Media Midwest Company
Topo Video, Inc. Video Media Corp. Paradigm 2000, Inc.
Finishing Touch Photo and Video

e. Measurement and Payment**. -** The completed work shall be paid for at the contract unit price for the following contract item (pay item):

Contract Item (Pay Item)	**Pay Unit**
Audio-Visual Recording	Lump Sum

Audio-visual Recording shall include all labor, equipment, and materials required to perform the recording and to provide the finished recording the Engineer.

Payment will be made for Audio-visual Recording following the review and acceptance of the recording by the Engineer. Within 21 days following the receipt of the recording, the Engineer will either accept it and authorize payment or require that any discrepancies in the recording be addressed prior to making payment.

a. DESCRIPTION - This item shall include all work described and required by the Plans and Specifications for which no item of work is listed in the Bid Form, including but not limited to:

- Scheduling and organization of all work, subcontractors, suppliers, testing, inspection, surveying, and staking
- Coordination of, and cooperation with, other contractors, agencies, departments, and utilities
- Protection of Utilities
- Placing, maintaining, and removing all soil erosion and sedimentation controls
- Maintaining drainage
- Maintaining drives, drive openings, sidewalks, pedestrian building access, mail deliveries, and solid waste/recycle pick-ups
- Storing all materials and equipment in designated areas
- Coordination efforts to furnish various HMA mixtures as directed by the Engineer
- Furnishing and operation vacuum-type street cleaning equipment a minimum of once per week, or more frequently, if directed by the engineer;
- Furnishing and operating vacuum-type utility structure cleaning equipment
- Furnishing and operating both vibratory plate and pneumatic-type ("pogo-stick") compactors
- Furnishing and operating all equipment required to complete the proposed work activities as specified
- Furnishing and operating a backhoe during all work activities;
- Furnishing and operating a jackhammer and air compressor during all work activities;
- Noise and dust control
- Furnish and install temporary barricades and fencing at excavation areas to protect workers and people in the work area.
- Mobilization(s) and demobilization(s)
- Furnishing submittals and certifications for materials and supplies
- Disposing of excavated materials and debris
- All miscellaneous and incidental items such as overhead, insurance, and permits.
- Interim and final site cleanup, including, but not limited to removal and disposal of excess materials, removal of all dirt and deleterious materials, power washing pavements, removal of all packing materials and labels, etc.
- Scheduling and organization of all work, subcontractors, suppliers, testing, inspection, and construction surveying and staking;
- coordination of, and cooperation with, other contractors, agencies, departments, and utilities;
- Coordination with City forces to stockpile and load used castings on City vehicles;
- Protection and maintenance of all existing utilities, including support, protection, capping, repair, replacement, connection or re-connection of existing pipes, and utilities damaged by the Contractor's operations;
- Maintaining and removing all soil erosion and sedimentation controls (as specified herein or as shown on project plans) for which no pay item exists;

- Maintaining the site, and all areas within the Construction Influence Area, in a well- graded and drained state at all times during the course of the project. De-watering and drainage of all excavations as required to maintain a stable. Open hole;
- The continuous maintenance of the temporary road surface with the Construction Influence Area throughout the duration of the construction. This includes any needed grading to maintain the surface in a smooth condition free of potholes, ruts, bumps, or other objectionable conditions;
- Temporary sheeting, bracing, and shoring of excavations in accordance with the applicable MIOSHA Standards;
- Maintaining driveway openings. Sidewalks, bike paths, mail deliveries, and solid waste/recycle pick-ups. This includes the placement and maintenance of maintenance aggregate across sidewalk ramps all as needed and as directed by the Engineer;
- Using quantities of dust palliative, maintenance aggregate, and hot patching mixture for use as temporary base, surfacing, and dust control at utility crossings, side roads, and driveways;
- Storing all materials and equipment off lawn areas;
- Temporary removal/re-location, storage, and re-installation/re-setting of existing street name, guide, and regulatory signs, mailboxes, newspaper tubes, etc. which conflict with the proposed construction;
- Site clean-up on a daily basis during the course of the project's construction.
- Coordination efforts to furnish the various required HMA mixtures as directed by the Engineer;
- Coordination efforts to furnish and operate various-size vehicles/equipment as directed by the engineer;
- Noise and dust control in accordance with the applicable City of Ann Arbor Ordinances;
- Mobilization(s) and demobilization(s) of all needed materials. Equipment, and personnel;
- Furnishing all required shop drawing, information submittals, and material certifications for all needed materials and supplies incorporated into the project;
- The proper off-site disposal of all excavated materials and debris;
- Removal of shrubs, brush, and trees less than 8" diameter (DBH) as shown on the plan sheets or as directed by the engineer;
- Fencing to protect excavation over 1' in depth during non-work hours. The fencing must be a minimum of 36" high, be constructed of orange HDPE material, and reasonably secured to prevent unwarranted access;
- Submittal of Close-Out Documents at the conclusion of work and prior to final payment, including as-built documentation of field changes and manufacturer's product warrantee and maintenance instructions;
- All miscellaneous and incidental items such as overhead, insurance, and permits; and,
- Meeting all requirements relating to Debarment Certification, David Bacon Act, and Disadvantaged Business Enterprise, and providing the necessary documentation.

b. MEASUREMENT AND PAYMENT - This item of work will be paid for on a pro rata basis at the time of each progress payment. Measurement will be based on the ratio between work completed during the payment period and the total contract amount. When all of the work of this Contract has been completed, the measurement of this item shall be 1.0 Lump Sum.

The completed work as measured for this item of work will be paid for at the Contract Unit Price for the following Contract (Pay) Item:

PAY ITEM	**PAY UNIT**
General Conditions, Max $650,000	Lump Sum

The unit price for this item of work shall include all labor, material, and equipment costs to perform all the work specified in the City Standard Specifications and as modified by this Detailed Specification.

CITY OF ANN ARBOR
DETAILED SPECIFICATION
FOR
ALLOWANCE FOR UNFORESEEN SITE CONDITIONS

Description

Allowance for unforeseen site conditions shall be paid under existing contract items where applicable, or under new item(s) at a negotiated price for work necessary for the completion of the project, but not expressly identified in the contract documents. Price paid shall be payment in full for all labor, material, and equipment required for remedying unforeseen physical conditions and shall be based upon an agreement negotiated and approved prior to beginning this Work.

Measurement and Payment

The completed work, as described, will be measured and paid for at the approved price for the following pay item:

Contract Item (Pay Item)	Pay Unit
Allowance for Unforeseen Site Conditions	Dollar

The approved price for this item shall include all labor, material, and equipment costs required to complete the work.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
MIXING PORTLAND CEMENT CONCRETE

CFS:JFS 1 of 1 APPR:CPM:TEB:12-17-21
FHWA:APPR:12-20-21

Add the following paragraph to subsection 1001.03.E.1 of the Standard Specifications for Construction:

Weigh and batch each material into its respective weighing device within the tolerance from the individual batch weights or quantities documented in the approved JMF as follows:

a. Cementitious Materials. Provide cementitious materials within -2.0 percent to +5.0 percent of the required weight.

b. Aggregates. Provide aggregate within ±3.0 percent of the required weight.

c. Water. Provide net water to not exceed the required water quantity and the required maximum water/cementitious ratio (w/cm).

d. Air Entraining Admixtures. Provide the necessary quantity or dosage rate per 100 pounds of cementitious material to achieve the required air content of fresh concrete.

e. Other Admixtures. Provide water-reducing and other admixtures within ±3.0 percent of the required quantity.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
ALKALI SILICA REACTIVITY OF FINE AGGREGATE USED IN PORTLAND CEMENT CONCRETE

CFS:CPM 1 of 2 APPR:TES:JFS:05-19-20
FHWA:APPR:05-27-20

a. Description. This special provision sets out the requirements for all fine aggregate used in Portland cement concrete (PCC) mixtures to be tested by an independent testing laboratory and determined to be resistant to the potential for deleterious expansion caused by alkali-silica reactivity (ASR). ASR testing is not required for concrete pavement repairs, temporary concrete pavements, and other items covered by the contract.

Except as explicitly modified by this special provision, all materials, test methods, and PCC mixture requirements of the standard specifications and the contract apply.

b. Definition. ASR is a chemical reaction which occurs over time within concrete between highly alkaline cement paste and reactive forms of silica found in some aggregates. In the presence of moisture, an expansive ASR gel is formed which can exert pressure within the concrete, causing random cracking and premature deterioration of the concrete.

c. Laboratory Requirements. The independent laboratory, including all associated testing equipment and staff performing ASR testing of aggregates, must be proficient in ASR testing in accordance with the applicable test methods and procedures. The laboratory must provide documentation to the Regions that they are qualified and proficient to conduct ASR testing in accordance with the required test procedures.

d. Laboratory Testing Requirements. Perform testing on fine aggregate proposed to be used in any PCC Job Mix Formula (JMF). The Contractor must ensure the testing is conducted in accordance with a designated standard test procedure described herein. Test results must conform to the specified criterion for one of the following standard test methods. The Rounding Method described in *ASTM E29* must be used when reporting expansion test results.

(1) Method 1. *ASTM C1293*. Concrete Prism Test. If the expansion of concrete prisms is not greater than 0.040 percent (rounded to the nearest 0.001 percent) after 1 year, the fine aggregate is considered non-deleterious to ASR and may be used in the JMF.

(2) Method 2. *ASTM C1567*. Mortar Bar Test. If no previous test data are available for the fine aggregate that shows it is resistant to ASR using Method 1, above, replace 25 to 40 percent of the Portland cement in the concrete mixture with a supplementary cementitious material (slag cement of fly ash). A blended cement meeting the requirements of *ASTM C595/C595M* containing the above Portland cement and supplementary cementitious material proportions may also be used.

Demonstrate the ability of the supplementary cementitious material to control the deleterious expansion caused by ASR by molding and testing mortar bars in accordance with the standard

test method described in *ASTM C1567* using the mix proportions and constituent sources for both the aggregates and the cementitious materials that will be used for the project. Make at least three test specimens for each cementitious materials-aggregate combination. If the average of three mortar bars for a given cementitious materials-aggregate combination produces an expansion less than 0.10 percent (rounded to the nearest 0.01 percent) at 14 days of immersion, the JMF associated with that combination will be considered non-deleterious to ASR. If the average expansion is 0.10 percent (rounded to the nearest 0.01 percent) or greater, the JMF associated with that combination will be considered not sufficient to control the deleterious expansion caused by ASR and the JMF will be rejected.

(3) Method 3. *ASTM C1260*. Mortar Bar Test. If the expansion of the mortar bars is less than 0.10 percent (rounded to the nearest 0.01 percent) at 14 days of immersion, the fine aggregate is considered non-deleterious to ASR and may be used in the concrete without the need for ASR mitigation.

The Engineer will not approve the use of the JMF if the expansion exceeds the threshold limits for the respective *ASTM* test method used. The test results and report are valid for 2 years from the completion of testing.

e. Submittals. A current ASR test report for the fine aggregate proposed to be used in the Job Mix Formula (JMF) must accompany each JMF. Ensure the ASR test report is accompanied by a certification stating which test procedure was followed and that all testing was conducted in accordance with the designated standard test procedure.

f. Measurement and Payment. All materials, labor, equipment, and laboratory facilities necessary to complete the work in accordance with this special provision is included in other contract pay items and no additional compensation will be permitted.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
QUALITY INDEX FOR PORTLAND CEMENT CONCRETE (FOR LOCAL AGENCY PROJECTS ONLY)

CFS:CPM 1 of 4 APPR:TES:JFS:05-28-20
FHWA:APPR:06-04-20

a. Description. This special provision establishes pay factor and price adjustments for Portland cement concrete (PCC) based on Quality Assurance (QA) testing of 28-day compressive strength and fresh concrete air content of PCC. Perform all work in accordance with the standard specifications and this special provision.

b. Materials. Mixture requirements will be in accordance with section 1004 of the Standard Specifications for Construction, unless otherwise specified in the contract.

c. Sampling. Sampling will be in accordance with subsections 1003.03.H and 1003.03.L of the Standard Specifications for Construction, except as modified herein. A sample is defined as a representative quantity of concrete taken during production which is used to measure the quality characteristics for the concrete. Compressive strength specimens for each sample consist of two cylinders, either 4-inch by 8-inch or 6-inch by 12-inch. A random number will be generated for each respective sublot. The sampling frequency for a production lot is one QA sample per sublot.

See subsection 1003.03.J in the Standard Specifications for Construction for reduced sampling and testing for small incidental quantities.

d. Quality Index Analysis. The Engineer's QA test results will be used to determine the pay factor (PF) and price adjustment (ADJ). The Contractor QC test results will be not used for PF and ADJ analysis. The Engineer will complete PF and ADJ analysis within 7 working days after completion of all 28-day compressive strength testing for the represented production lot or quantity of concrete. All values of PF and OLPF in these formulas are decimal, not percent. All values of PF and OLPF are rounded to two decimal places.

Table 1: Quality Index Parameter Specification Limits

Quality Characteristic	Specification Limits
Air Content of Fresh Concrete (percent)	5.5 – 8.5
Rejection Limit (percent)	<5.0 or >9.0
Conc. Temp. (deg. F)	45 - 90 at time of placement
Slump (max.) (inch)	See footnotes a through l in Table 1004-1 of the Standard Specifications for Construction
28-day Compressive Strength (psi)	For LSL see Table 2
Rejection Limit - 28-day Compressive Strength	See Table 2

Table 2: Quality Index Parameter Specification Limits for 28-Day Compressive Strength

Parameter	Grade of Concrete						
	3000	3500	3500HP	4000	4000HP	4500	4500HP
Lower Specification Limit (psi)	3000	3500	3500	4000	4000	4500	4500
Rejection Limit for an Individual Strength Sample Test Result (psi)	2500	3000	3000	3500	3500	4000	4000

1. Pay Factor for 28-Day Compressive Strength (PF_s). (not to exceed 1.00)

PF_s = (QA Test Strength)/LSL

Where:

QA Test Strength = QA 28-day compressive strength sample test result.

LSL = Lower specification limit (see Table 2).

If the tested strength does not meet the rejection limit specified in Table 2, the Engineer will require additional evaluation as described in section e of this special provision.

2. Pay Factor for Air Content of Fresh Concrete (PF_{ac}). The pay factor for air content of fresh concrete (PF_{ac}) will be in accordance with Table 3.

Table 3: Air Content of Fresh Concrete Pay Factor (PF_{ac})

Air Content of Fresh Concrete (percent)	Pay Factor (PFac)
5.5 – 8.5	1.00
5.0 – 5.4	0.50
Below 5.0	Rejection
8.6 – 9.0	0.75
Above 9.0	Rejection

If the air content of fresh concrete is below 5.0 or above 9.0 percent, the Engineer will elect to do one of the following:

A. Require removal and replacement of the entire quantity of concrete represented by the test with new testing conducted on the replacement concrete and repeat the evaluation procedure.

B. Allow submittal of a corrective action plan for the Engineer's approval. If the Engineer does not approve the plan for corrective action, subsection d.2.A. will be applied. All costs associated with plan submittal and corrective action under this subsection will be borne by the Contractor.

3. Overall Lot Pay Factor (OLPF). Use the following formula to determine the OLPF and ADJ. The OLPF will not exceed 1.00:

$OLPF = (0.60 \times PF_s) + (0.40 \times PF_{ac})$

Where:

PF_{ac} = Pay factor for Air Content (see Table 3)

4. Price Adjustment (ADJ). Use the following formula to determine the ADJ.

ADJ = (OLPF - 1)(Price)

5. Price Adjustment for Small Incidental Quantities. Price adjustment for 28-day compressive strength deficiencies will be based on test results for the corresponding weekly QA test specimens and the pay factor (PF_s) calculated in accordance with the formula defined in subsection d.1. The price adjustment is calculated by the following equation:

$(ADJ) = (PF_s - 1)(Price)$

Where:

ADJ = Price adjustment per pay unit to be applied to the quantity represented by the QA test.

PF_s = Pay Factor for 28-day compressive strength (not to exceed 1.00).

Price = Base price when established for the pay item or the Contractors unit price bid when concrete is included in another pay item without a base price.

e. Evaluation of Rejectable Concrete. The Engineer will require additional evaluation to decide what further action may be warranted. Acceptance for air content of fresh concrete will be based on QA test results reported at the time of concrete placement.

If the Engineer determines that non-destructive testing (NDT) is appropriate, this work will be done by the Contractor in the presence of the Engineer within 45 calendar days of concrete placement. All costs associated with this work will be borne by the Contractor. Ensure complete set of non-destructive tests is conducted (in accordance with the respective standard test method) at a minimum three randomly selected locations. If NDT is used to estimate the in-situ strength, a calibrated relationship between the project job mix formula (JMF) under evaluation and the NDT apparatus must have been established prior to NDT testing in accordance with its respective standard test method.

If the 28-day compressive strength QA test results show that the rejection limit (as specified in Table 2) has not been achieved, the quantity of concrete under evaluation will be rejected and the Engineer will require additional evaluation to decide what further action may be warranted.

Propose an evaluation plan and submit it to the Engineer for approval before proceeding. The results from NDT will be used only to decide what further action is required. This determination will be made by the Engineer, as follows:

1. For Non-structural Concrete. If no test result from non-destructive testing falls below the lower specification limit (LSL) 28-day compressive strength, the represented quantity of

concrete under evaluation will remain in place and a pay factor for 28-day compressive strength (PF_s) of 1.00 will be applied for overall lot pay factor (OLPF) and price adjustment (ADJ) determinations in accordance with section d of this special provision.

2. For Structural Concrete (including overhead sign foundations). If no test result from non-destructive testing falls below the lower specification limit (LSL), the represented quantity of concrete under evaluation will remain in place and a pay factor for 28-day compressive strength (PF_s) of 0.85 will be applied for overall lot pay factor (OLPF) and price adjustment (ADJ) determinations will be in accordance with section d of this special provision.

3. If one or more of the non-destructive test results fall below the lower specification limit (LSL) 28-day compressive strength, the Engineer may elect to do one of the following:

A. Require removal and replacement of the entire rejected quantity of concrete, including new initial tests for quality index analysis conducted in accordance with section d of this special provision.

B. Allow the Contractor to submit a plan for corrective action, for the Engineer's approval, to address the disposition of the rejected concrete. If the Engineer does not approve the plan for corrective action, subsection e.3.A of this special provision will be applied. All costs associated with plan submittal and corrective action under this subsection will be borne by the Contractor.

C. Allow the in-situ quantity of concrete under evaluation to remain in place and a pay factor (PF_s) of 0.50 will be applied for overall lot pay factor (OLPF) and price adjustment (ADJ) determinations will be in accordance with section d of this special provision.

f. Measurement and Payment. If a price adjustment is made for reasons included in this special provision, that adjustment will be made using the base price established for the specific item. If a contract unit price requires adjustment for other reasons not described in this special provision, the adjustments will be made using the original unit price and the adjustments will be cumulative.

CITY OF ANN ARBOR
SPECIAL PROVISION
FOR
RAILROAD INSPECTION AND FLAGGING

DLZ/CLH:COAA/FC 1 of 1 09-06-22

a. Description. This work consists of providing advance notice to the Railroad and the Engineer meeting the railroad notice requirements found in the contract for providing flaggers for work on, above, or below Railroad property.

b. Materials. None specified.

c. Construction. Ensure construction methods are in compliance with the requirements in the contract.

d. Measurement and Payment. The Contractor must pay or pre-pay (if required by the Railroad) to the Railroad the full amount of the Railroad's invoice for inspection and flagging. Prior to submitting payment requests for reimbursement of flagging costs to the Engineer, review for accuracy the actual flagging costs and days worked against the billed or pre-paid amount. Resolve any inconsistencies with the Railroad prior to submitting to the Engineer. Provide to the Engineer a statement of costs paid for flagging and detailed itemization to support the actual cost paid or pre-paid amount. The Engineer will reimburse the Contractor upon satisfactory review and approval of submitted documentation for inspection and flagging services. This process will continue as long as the need for flagging services exists.

Costs incurred for inspection and flagging due to the failure of the Contractor to properly notify the Railroad in advance of beginning work which may require a flagger as stated in the contract, are the responsibility of the Contractor. Any dates invoiced beyond approved Progress Clause dates or approved extension of time dates without liquidated damages will not be reimbursed unless approved otherwise by the Engineer.

Provide the Railroad a documented notice 5 days in advance when flagging is no longer needed, with a copy to the Engineer and retain a copy of this documented notification. If the notification to the Railroad is not at least 5 days in advance of no longer needing flagging, the Railroad will schedule and the Contractor must pay such flagging services until said cancellation notice is confirmed by the Railroad. Before final payment is made by the Engineer to the Contractor for the project, satisfactory evidence must be submitted indicating all bills for inspection and flagging services furnished by the Railroad have been paid. This pay item covers only inspection, and flagging services provided by the Railroad.

Pay Item	**Pay Unit**
Railroad Inspection and Flagging	Dollar

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
FEDERAL AVIATION ADMINISTRATION NOTIFICATION FOR STRUCTURE WORK

BRG:BMW 1 of 1 APPR:JAB:JD:04-02-20
FHWA:APPR:04-03-20

a. Description. This work consists of obtaining any necessary permits and notifying the Federal Aviation Administration (FAA) and/or local airport zoning authority if any permanent structures or temporary structures (temporary scaffolding, forms, poles, crane booms, etc.) exceed the requirements listed in this special provision, no matter the duration.

A copy of any permits (FAA, Michigan Tall Structure and local or municipal airport zoning) obtained by the Department are included in the contract.

b. Materials. None specified.

c. Construction. The Contractor is required to provide notice to the FAA, and acquire any necessary permits, if the proposed construction or alteration of permanent or temporary structures meets any of the following criteria:

1. Anything over 200 feet above ground level (AGL) at the project site, including temporary construction and/or equipment.

2. Any changes or variations that exceed the heights or locations set forth in the permits, if permits are included in the contract.

3. Any changes or variations that exceed the height set forth on the contract plans, if permits are not included in the contract.

Schedule operations to allow for the maximum 45 day FAA review period. Extensions of time will not be granted for failure to submit the FAA notifications 45 days prior to commencement of construction activities subject to notification requirements.

d. Measurement and Payment. This work will not be paid for separately, but will be included in costs for other pay items in the contract. Payment for any/all FAA required safety equipment, obstruction lighting, flags, nighttime crane procedures, etc. will also be considered to be included in the costs for other pay items in the contract.

CITY OF ANN ARBOR
SPECIAL PROVISION
FOR
RELOCATION AND SITE CLEANUP

DLZ/CLH:COAA/FC 1 of 2 03-04-22

a. Description. This work consists of relocation of unauthorized occupants and site cleanup. Complete this work as specified herein and as directed by the Engineer.

Take the following steps to ensure the orderly and safe relocation of unauthorized occupants on the site and to provide safe working conditions prior to the start of work:

1. Determine the number of unauthorized occupants and dwellings within the project limits.

2. Contact the Michigan Department of Health and Human Services at (517) 373-3500, at least 48 hours before commencing any removal of unauthorized occupants.

3. Notify the unauthorized occupants, verbally and in writing, at least 72 hours in advance to clear their belongings and vacate the site.

4. Contact the local police authority, if necessary, at least 48 hours in advance.

   A. City of Ann Arbor Police Department (Non-Emergency). (734) 794-6920.

   B. Washtenaw County Sheriff's Department (Non-Emergency). (734) 971-8400.

5. Provide an experienced specialty subcontractor qualified to clean up and dispose of regulated biohazardous and medical waste in a safe and appropriate manner meeting all applicable federal, state and MIOSHA requirements, and as approved by the Engineer. The minimum qualifications include MIOSHA blood borne pathogen training relative to worker safety and protection when handling, packaging, and disposing of biohazardous waste. A list of companies available to clean up and dispose of this type of waste is included herein.

6. Dispose of any regulated medical waste in accordance with all applicable federal, state, and local regulations. Upon proper disposal, the specialty subcontractor must provide to the Engineer a "Proof of Destruction" certification from the disposal facility.

b. Materials. None specified.

c. Construction. None specified.

d. Measurement and Payment. The completed work, as described, will be paid for based on original invoices from the disposal facility submitted to the Engineer using the following pay item:

Pay Item	**Pay Unit**
Relocation and Site Cleanup	Dollar

Relocation and Site Cleanup includes all labor, equipment, and materials necessary to complete the work as described. The cost for shoulder or lane closures, if necessary, are included in the payment for this item of work.

Elite Trauma Clean-Up, Inc.
43686 N. Gratiot Avenue
Clinton Township, MI 48036
Phone: (586) 954-4881

Stericycle
1315 W. Hill Road
Flint, MI 48507
Phone: (866) 783-6188

Bio Clean Services
P.O. Box 7191
Canton, OH 44705
Phone: (800) 901-2988

Steri-Clean
10171 Bergin Road
Howell, MI 48843
Phone: (734) 799-8030

Other local facilities that may offer assistance:

Shelter Association of Washtenaw County
312 W Huron St
Ann Arbor, MI 48103
Phone: (734) 662-2829 ext. 254

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
VERTICAL EXPLORATORY INVESTIGATION FOR RELOCATION

COS:MRB 1 of 2 APPR:DMG:NAL:04-30-20
FHWA:APPR:05-06-20

a. Description. When proposed work must be relocated as directed by the Engineer, this special provision is used to compensate the Contractor to locate and expose underground infrastructure and obstructions, such as culverts, sewers and utilities. Perform this work only when conflicts are found in the planned work location. This special provision is not to compensate for the Contractor's responsibilities in subsection 107.12 of the Standard Specifications for Construction.

b. Materials. Use Granular Material Class III in accordance with section 902 of the Standard Specifications for Construction for backfill. Use material removed during exploratory investigation for backfill only if approved by the Engineer.

c. Construction. The owner of any sewer or utility to be exposed will not take the facilities out of service during the exploratory investigation. Contact utility owners in accordance with subsection 107.12 of the Standard Specifications for Construction.

Advance the exploratory excavation using vacuum excavation, hand digging, conventional machine excavation, or a combination thereof subject to approval of the Engineer. Allow the Engineer access to document the necessary information. If the technique used to advance the excavation causes any damage to the existing facilities, immediately contact the utility owner and cease all work until an alternate method is approved by the Engineer.

Take care to protect the exposed culvert, sewer or utility from damage during construction. The Contractor is responsible for all costs associated with the repair work and out of service time of all broken or damaged existing culverts, sewers or utilities as a result of any action by the Contractor. If the exploratory investigation results in damage to utilities, contact the owner of such utility to coordinate the repair. Repair or replace culvert, sewer or utility, damaged during exploratory excavation, in accordance with the standard specifications and as approved by the Engineer.

Obtain the Engineer's approval before backfilling the excavation. Complete backfilling no later than 24 hours after approval has been given. Backfill in accordance with subsection 204.03.C of the Standard Specifications for Construction. Dispose of excess material in accordance with the standard specifications.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

Pay Item	**Pay Unit**
Exploratory Investigation, Vertical	Foot

Exploratory Investigation, Vertical will be measured by the foot from top of existing grade vertically to the bottom of the excavation for up to a 4-foot maximum diameter hole, or as approved by the Engineer. The excavated depth of each 4-foot maximum diameter hole will be measured separately for payment.

Exploratory Investigation, Vertical includes all costs associated with repair or replacement resulting from the Contractor's activities. Providing necessary lane, shoulder and/or sidewalk closures required to perform work will be paid for by other associated items in the contract. Restoration work will be paid for by other associated items.

CITY OF ANN ARBOR
SPECIAL PROVISION
FOR
DEWATERING SYSTEM, EXCAVATION

DLZ/CLH:COAA/FC 1 of 2 09-07-22

a. Description. This work consists of lowering the groundwater table to facilitate the excavation. This work will require the use of pumps or well points, deep wells, or other measures that are utilized to control and manage groundwater.

b. Well Points and Deep Wells. Ensure groundwater control performed by deep well and/or well point pumping systems is done without damage to property or structures and without interference with the rights of the public, owners of private property, pedestrians, vehicular traffic or the work of other contractors. Any pumping methods used for dewatering and control of groundwater and seepage must have properly designed filters to ensure that adjacent soil will not be pumped with the water, thus creating voids underground and around the face of the excavation or under existing structures. Ensure the loss of fines is limited to no more than 5 parts per million by volume in the extracted water. Ensure the filter design is reviewed and approved by the Engineer before placement.

Perform the dewatering operations in a proper and predetermined sequence with the excavation operation such that the perimeter, bottom and face of the excavation are stable. Dewatering well diameter, pumping rate and well spacing must provide adequate drawdown of the water level. Properly locate wells to intercept groundwater that otherwise would enter the excavation and interfere with the work. Install observation wells at key locations for observation of groundwater levels during the excavation. Submit a plan for locations and monitoring frequency of the observation wells to the Engineer a minimum of 7 calendar days in advance of placement of the dewatering system. Add additional wells as needed to dewater to the groundwater to the elevation shown on the plans.

Filters or settling devices may be required before discharge to ensure that storm sewers, sanitary sewer systems or surface waters are not adversely affected by construction debris or increased sediment load.

c. Storm Sewer, Sanitary Sewer or Surface Water Discharge. Monitor the volume of water discharged to the storm sewer system, sanitary sewer system or as surface water discharge by using a totalizing turbine type flow meter. Place the flow meter in-line on the dewatering system effluent line, ensure it is designed for high flow applications and has a flow totalizing register that is adequately sealed to eliminate fogging and condensation. Install the type of meter used in accordance with the manufacturer's instructions and be approved by the Engineer before placement.

Written permission from the wastewater treatment plant authority is required prior to discharge to the sanitary sewer system. Provide a copy of the written authorization to the Engineer prior to discharging any water to the system.

Secure a NPDES permit from the EGLE prior to any discharge to a storm sewer or directly to a surface water body.

Monitor and document the volume of flow being discharged to the storm sewer, sanitary sewer or the surface water daily by reading the register on the flow meter. Provide this information to the Engineer daily or as otherwise approved.

d. Construction. Lower the groundwater to a depth of at least 3 feet below the bottom of any excavation. Determine the methods and materials required to accomplish this work, subject to approval by the Engineer before initiation or installation of the dewatering system.

The Engineer may order corrective actions to the dewatering system at any time due to deficiencies in the system at no additional cost to the contract.

Remove dewatering system and all associated appurtenances when no longer needed and restore the area as directed by the Engineer.

Abandon deep wells and observation wells in accordance with current EGLE requirements when no longer needed.

e. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

Pay Item	**Pay Unit**
Dewatering System, Excavation	Each

Dewatering System, Excavation will be measured for each excavation area. The unit price includes all labor, equipment, materials, wells, piping, supplies, power, and fuel necessary for the installation, operation, maintenance, removal and the disposal of all surplus materials as described herein. This pay item includes the cost of disposal of all water pumped from below ground to facilitate underground construction.

All costs associated with obtaining an NPDES permit and any locally required permits are included in this pay item.

The installation, maintenance and removal of deep wells and observation wells are included in this pay item.

The cost for treatment of the water at the wastewater treatment plant is included with this pay item. There will be no compensation for idled personnel or equipment due to any system corrections ordered by the Engineer to remedy any deficiencies.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
SAMPLING ASPHALT BINDER ON LOCAL AGENCY PROJECTS

CFS:TRC 1 of 1 APPR:JWB:KPK:02-19-20
FHWA:APPR:02-19-20

a. Description. This work consists of the Contractor taking samples of the asphalt binder and delivering the samples to the Engineer prior to incorporation into the hot mix asphalt mixture.

b. Materials. For informational purposes, original samples of asphalt binder will be taken by the Contractor and delivered to the Engineer prior to incorporation into the mixture. The frequency of sampling will be determined by the Engineer.

The Contractor must certify in writing that the materials used in the HMA mixture are from the same source as the materials used in developing the HMA mixture design and the bond coat is from an approved supplier as stated in the *Material Quality Assurance Procedures Manual*.

c. Construction. None specified.

d. Measurement and Payment. The cost of obtaining and delivering the samples to the Engineer will be included in the hot mix asphalt (HMA) pay items in the contract.

CITY OF ANN ARBOR
SPECIAL PROVISION
FOR
TYPE B MICROPILE CONSTRUCTION - LRFD

DLZ/CLH:COAA/FC 1 of 14 04/29/2022

a. Description. This work consists of furnishing, installing, and testing Type B micropiles of the resistance, and to the dimensions, shown on the plans. Designing the grout mix. Designing, furnishing, installing, and removing load testing apparatuses. Complete this work in accordance with the standard specifications, except as modified herein.

Examine the plans and visit the site prior to bidding the work to assess the site geometry, equipment access conditions, subsurface conditions, location of existing structure(s), overhead restrictions, and any other factors which may influence the bid.

1. Contractor Qualifications. Below is the list of prequalified Micropile Contractors:

Hardman Construction, Inc. 242 South Brye Road Ludington, MI 49431 Contact: Martin E. Gamble Phone: 231-845-1236 Fax: 231-845-0422	Keller North America, Inc. 7550 Teague Road, Suite 300 Hanover, MD 21076 Contact: Phone: 410-551-8200 Fax: 410-799-8926
Malcolm Drilling Company, Inc. 102 Hill Court Mukwonago, WI 53149 Contact: Brady Frederick Phone: 415-901-4400 Fax: 415-901-4421	Nicholson Construction Company 4124 Douglas Avenue Kalamazoo, MI 49004 Contact: Dan Thome Phone: 412-221-4500 Fax: 412-221-7826
Spartan Specialties LTD 6250 Sims Drive Sterling Heights, MI 48313 Contact: Steve Maranowski Phone: 586-826-8811 Fax: 586-826-8699	

Other micropile Contractors will be considered but will need to submit their qualifications to the Engineer for review at the preconstruction meeting. Submit qualifications satisfying the requirements below. No micropile construction can begin until the Engineer has approved the Contractor's qualifications.

A. Documented experience with at least 5 projects performed within the last 5 years involving at least 100 micropiles of capacity similar to those shown on the plans.

B. Documented experience in micropile drilling and grouting in subsurface conditions similar to the project site.

C. Documented experience of the Contractor's supervisor, on-site foreman, and drill rig operators, who are employed by the Contractor or specialty subcontractor and who

have experience with at least three projects within the last 5 years that had subsurface conditions similar to the project site.

2. Definitions. The following definitions apply to this work:

Alignment Load (AL). A small load applied to a micropile during testing to keep the testing equipment correctly positioned.

Apparent Free Micropile Length. The length of the pile that is not bonded to the surrounding ground, as calculated from the elastic load extension data during testing.

Bond Breaker. A sleeve or coating placed over the bar reinforcement to prevent load transfer.

Bond Length. The length of the pile that is bonded to the surrounding ground and which is used to transfer the applied axial loads to the surrounding ground.

Casing. The steel pipe introduced during the drilling process to temporarily stabilize the drill hole. Depending on the details shown on the plans, the casing may be fully extracted during or after grouting; or may remain partially or completely in place permanently as part of the file pile.

Centralizer. A device used to centrally locate the bar reinforcement within the drill hole.

Core Steel. Reinforcement bars used to strengthen or stiffen the pile, excluding any casing left in place.

Corrosion Inhibiting Compound. Material used to protect against corrosion and/or lubricate the reinforcement inside a bond breaker.

Coupler. The means by which the load can be transmitted from one partial length reinforcement to another.

Creep Movement. The movement that occurs during a creep test of a micropile under a constant load.

Duplex Drilling. A drilling system involving the simultaneous advancement of inner drill rod and outer drill casing. Flush from the inner drill rod is permitted to exit the drill hole via the annulus area between the drill rod and casing.

Elastic Movement. The recoverable movement measured during a micropile test.

Encapsulation. A corrugated tube protecting the reinforcement against corrosion.

Free (Unbonded) Length. The designed length of the micropile that is not bonded to the surrounding ground or grout during testing.

Micropile. A small diameter, bored, cast-in-place pile, in which most of the applied load is resisted by the reinforcement.

Nominal Resistance (R_n). The theoretical ultimate resistance of the micropile. The nominal resistance is shown on the plans. The nominal resistance is the resistance on which the load tests are based.

Overburden. Non-lithified material, natural or placed, which normally requires cased drilling methods to provide an open borehole to underlying strata.

Plunge Length. Transition zone between the upper cased section and the uncased portion of bond length.

Preloading. The principle whereby load is applied to the micropile, prior to the micropile's connection to the structure, to minimize any structural movement in service.

Primary Grout. Portland cement based grout that is injected into the micropile hole prior to or after the installation of the reinforcement to provide the load transfer to the surrounding ground along the micropile and affords a degree of corrosion protection in compression.

Production Pile. A micropile constructed for use in the final structure.

Proof Load Test. Incremental loading of a production pile, recording the total movement at each increment.

Reinforcement. The steel component of the micropile which accepts and/or resists applied loadings.

Residual Movement. The non-elastic (non-recoverable) movement of a micropile measurement during load testing.

Single Tube Drilling. The advancement of a steel casing through overburden usually aided by water flushing through the casing; also known as "external flush." The fluid may or may not return to the surface around the casing, depending largely on the permeability of the overburden.

Spacer. A device to separate elements of multiple element reinforcement.

Tremie Grouting. The placing of grout in a borehole via a grout pipe introduced to the bottom of the hole. During grouting, the exit of the pipe is kept at least 10 feet below the level of the grout in the hole.

Type B Micropile. A micropile constructed by injecting a neat cement grout under pressure (typically 40 to 150 psi) into the drilled hole while the drill casing is withdrawn.

Verification Load Test. A micropile load test performed to verify the micropile nominal resistance based on the construction methods proposed. Verification load tests are performed on non-production piles, prior to installation of production piles.

b. Materials.

1. Water. Use water in accordance with section 911 of the Standard Specifications for Construction.

2. Admixtures. Use admixtures in accordance with ASTM C 494.

3. Cement. Use Type I, Type II, Type III or Type V Portland cement in accordance with AASHTO M 85 from one manufacturer.

4. Fine Aggregate. Use sand in accordance with AASHTO M 45.

5. Reinforcement. Bend tests for the epoxy coating are not required. Use solid epoxy-coated deformed steel reinforcing bars conforming to AASHTO M 31 for Grade 60 and Grade 75 or AASHTO M 275 for Grade 150, as shown on the plans. When a bearing plate and nut are required to be threaded onto the top end of reinforcing bars for the pile top to footing anchorage, the threading may be continuous spiral deformed ribbing provided by the bar deformations (e.g. Dywidag or Williams continuous threadbars or approved equal) or may be cut into a reinforcing bar. If threads are cut into a reinforcing bar, the next larger bar number designation from that shown on the plans must be provided, at no additional cost. Bar tendon couplers, if required, must develop the ultimate tensile strength of the bars without any evidence of failure.

6. Permanent Casing. Use steel pipe in accordance with ASTM A 252, Grade 3 with a yield strength not less than 80 ksi and a minimum elongation of 15 percent. Threaded casing joints must develop at least the required nominal resistance used in the design of the micropile.

7. Structural Steel. Use structural steel in accordance with section 906 of the Standard Specifications for Construction.

8. Centralizers. Use schedule 40 PVC pipe or tube, or epoxy-coated steel in accordance with subsection 905.03.C of the Standard Specifications for Construction, or other materials that are not detrimental to the steel reinforcement and permanent casing. Do not use wood. Centralizers and spacers must be securely attached to the reinforcement; sized to position the reinforcement within 1/2 inch of plan location from center of pile and sized to allow grout to freely flow up the drillhole and casing and between the spacers and reinforcing bar.

9. Couplers. Use steel reinforcement couplers, meeting the approval of the Engineer, which can develop the ultimate tensile strength of the steel reinforcement without evidence of failure.

10. Grout Protection. Provide a minimum of 1 inch grout cover over bare or epoxy-coated bar and minimum of 1/4 inch grout cover over bar couplers.

c. Construction.

1. Equipment. Use duplex equipment and methods to provide a fully cased drill hole over the entire specified minimum length of micropile without advancing the inner drill beyond the temporary casing and without using air as a flushing medium. Use pressure grouting equipment capable of grouting the bonded zone at grouting pressures not less than

50 psi. Use equipment suitable for drilling through the conditions encountered without causing damage to any overlying or adjacent structures, utilities, services, or ground.

Use equipment capable of producing grout that is free of lumps and undispersed cement. Equip the grout pump with a pressure gauge to monitor grout pressures. Use a second pressure gauge at the point of injection at the top of the micropile. Pressure gauges must be capable of measuring pressures not less than 150 psi or twice the actual grout pressures, whichever is greater. Size grouting equipment to enable micropiles to be grouted in one continuous operation.

2. Submittals. Submit 5 copies of items A through C below to the Engineer not less than 21 calendar days prior to micropile construction. Submit 5 copies of items D through H below to the Engineer not less than 21 calendar days prior to load testing or incorporation of the respective materials into the work. The Department requires 14 calendar days to review a submittal after it has been received. Additional review time necessary due to incomplete or unacceptable submittals is not cause for a claim for additional time or compensation. All costs and delays associated with incomplete or unacceptable submittals will be borne by the Contractor.

A. Installation plan that includes a step-by-step description of the proposed micropile construction procedure, including drilling equipment, drilling methods, casings, flushing medium, grouting methods, personnel, testing, and testing equipment to ensure quality control. Include the step-by-step procedure on the working drawings in sufficient detail to allow the Engineer to monitor and validate the construction and quality of the micropiles.

B. Proposed start date and micropile installation schedule.

C. Information on headroom and space requirements for installation equipment to verify that the proposed equipment can perform at the site. If the micropiles will be installed to support an existing structure or installed adjacent to an existing structure, inspect the condition and site of the existing structure(s) in the presence of the Engineer. Provide a copy of photographic documentation of the pre-construction conditions to the Engineer.

D. Detailed description of proposed management procedures for the control and disposal of excess surface water, drill flush, grout, and any resultant product of the micropile installation. Do not excavate flush pits at or below the floodplain elevation in accordance with subsection 205.03.P of the Standard Specifications for Construction.

E. Certified mill test reports for bar reinforcement and permanent casing, or coupon test results for permanent casing without mill certification. Include ultimate strength, yield strength, elongation, and material properties composition with the reports.

F. Grouting Plan. Provide complete descriptions, details and supporting calculations for:

(1) Grout mix design and type of materials to be used, including certified test data and trial batch reports.

(2) Specific gravity of the grout mix.

(3) Methods and equipment for accurately monitoring and recording the grout depth, grout volume, and grout pressure as the grout is being placed.

(4) Grouting rate calculations, if requested by the Engineer. Base the calculations on the initial pump pressures or static head on the grout and losses throughout the placing system, including anticipated head of drilling fluid (if applicable) to be displaced.

(5) Estimated curing time for grout to achieve the required strength. Submit previous test results for the proposed grout mix. The test results must have been completed within 1 year of the start of grouting for initial verification load test. Test grout during production as specified herein.

(6) Procedure and equipment proposed for monitoring grout quality and consistency.

G. Detailed working drawings for the proposed micropile load testing. Include all drawings and details necessary to clearly describe the proposed test methods, reaction frame, reaction piles, system test load capacity, equipment setup, types and accuracy of apparatus to be used for applying and measuring the test loads, and pile top movements according to the load test requirements specified herein. Submit structural design calculations for all structural components of the test apparatus.

H. Calibration reports and data prepared by an independent testing laboratory within 90 calendar days of the date submitted for each test jack, pressure gauge, master pressure gauge, and electronic load cell to be used. Do not perform load testing until the Engineer has reviewed and accepted the calibration reports and data.

3. Fabrication.

A. Structural Steel. Fabricate footing connections meeting the details shown on the plans and in accordance with subsection 707.03 of the Standard Specifications for Construction.

B. Permanent Casing. Use casing with an outside diameter and wall thickness meeting the dimensions shown on the plans. Threaded casing joints must develop the nominal resistance of the pile cross-section strength. Threaded casing joints must be rigid enough to provide proper alignment so that no eccentricities or angles occur along the axis of the micropile. If welding of the casing is necessary, perform welding according to subsection 707.03 of the Standard Specifications for Construction.

C. Bar Reinforcement. When a bearing plate and nut (pile cap anchorage) are required to be threaded onto the top end of the reinforcement for the pile-to-footing connection, the threading may be continuous spiral bar deformations or may be cut into the reinforcement. If threads are cut into the reinforcement, use a reinforcing bar, meeting the approval of the Engineer, with a diameter larger than what is shown on the plans at no additional cost to the Department.

4. Installation.

A. Utilities. Field-verify the location of all utilities shown on the plans. Notify the Engineer of any utility locations different than what is shown on the plans that may require micropile relocations or structure design modifications. Additional costs due to micropile relocation and/or structure design modifications resulting from utility locations different than what is shown on the plans will be paid for extra work.

B. Excavation. Coordinate the work and excavations so the micropiles are safely constructed. Do not excavate slopes steeper than those shown on the plans. Do not perform excavations above or below the micropiles without approval from the Engineer.

C. Site Drainage Control. Control and properly dispose of drill flush, excess grout, and any other construction-related waste according to the *1994 PA 451, Part 115 - Solid Waste Management and Part 31 - Water Resources Protection* and all other applicable regulations. Repair damage caused by construction activity and waste at no additional cost to the Department. Immediately notify the Engineer if unanticipated existing subsurface drainage structures are discovered during excavation or drilling. Suspend work in these areas until remedial measures, meeting the approval of the Engineer, are implemented. The remedial measures or repair work resulting from encountering unanticipated subsurface drainage structures will be paid for as extra work.

D. Tolerances. Install micropiles with a variation of not more than 2 percent of total length from the vertical or batter line shown on the plans. After installation, the position of each micropile must be within 3 inches of the position shown on the plans. However, the distance between the edge of all micropiles and the outline of the superimposed concrete must not be less than 9 inches.

Cut off the micropiles normal to the longitudinal axis of the pile and within 1 inch of the elevation specified on the plans. Install core steel within 0.5 inches of the location shown on the plans.

E. Drilling. Select a duplex drilling method that does not cause distress to existing structures. The selected method must not compromise in situ ground conditions, the grouting procedure, and the grouting pressure used. Estimate the grout take. No additional compensation will be given for grout overruns. Do not use drilling fluid containing bentonite.

The drill hole must be open along its full length to at least the minimum hole diameter shown on the plans prior to placing grout and reinforcement. Use casing to support the pile drill hole from caving. Prevent detrimental ground movements. Detrimental ground movement is defined as ground movement which requires remedial repair measures at any time. Costs for remedial measures due to encountering unanticipated naturally occurring subsurface obstructions, such as cobbles and boulders, will be borne by the Contractor. Notify the Engineer if subsurface conditions vary from those shown on the plans at the bottom of the micropile.

F. Ground Heave or Subsidence. Monitor the conditions in the vicinity of micropile construction for signs of ground heave or subsidence. Notify the Engineer if signs of movements are observed and suspend construction if directed by the Engineer. If the

Engineer determines that the movements require corrective action, perform the necessary repairs to the site and damages to adjacent structure(s). Bear the cost of the corrective actions and repairs unless damages are a result of differing site conditions, as determined by the Engineer. Submit a description of modified construction methods to the Engineer for review, to avoid further heave, subsidence, and damage to adjacent structures(s).

G. Placing and Splicing Bar Reinforcement. Place reinforcement prior to grouting or insert reinforcement into grout. Ensure reinforcement is free from dirt and free from excessive rust, loose mill scale, or other foreign material when placed. When multiple reinforcing bars are used, ensure they will not be damaged or disturbed during installation and grouting. If necessary, use larger diameter reinforcing bars than what is shown on the plans at no additional cost to the Department. Place centralizers and spacers at a spacing not exceeding 10 feet. Space the uppermost and lowermost centralizer not more than 5 feet from the top and bottom of the micropile. Centralizers and spacers must permit the free flow of grout without misalignment of the reinforcing bar(s) and permanent casing. Do not drive or force partially inserted reinforcement into the drill hole. Re-drill and reinsert reinforcement, at no additional cost to the Department, when necessary to facilitate reinforcement placement. Secure splices in proper alignment and in a manner to avoid eccentricities or angle between the axis of the two lengths to be spliced. When multiple reinforcing bars are used in a group, stagger the splices not less than 12 inches apart. Reinforcing bar splices must not be less than two casing diameters from a permanent casing splice.

H. Grouting. Place the grout the same day the bonded length is drilled. Use a stable neat cement grout or sand cement grout with a 28-day compressive strength not less than 5000 psi. If used, proportion admixtures according to the manufacturer's recommendations. Continuously agitate grout prior to placement. Place grout within 30 minutes of initial mixing. Inject grout from the lowest point of the drill hole and continue until uncontaminated grout flows from the top of the pile.

Inject grout under pressure as the temporary casing is withdrawn. Extract temporary casing in stages ensuring that after each length of casing is removed, the grout level is brought back up to the ground level before the next length is removed. The tremie pipe or casing must always extend below the level of the existing grout in the drill hole. Control grout pressures and grout takes to prevent excessive heave or fracturing of surrounding ground. The grout tube may remain in the hole upon completion of grouting if the grout tube is filled with grout.

I. Pile Cutoff. Do not use a torch to cut the casing to the cutoff elevation shown on the plans after grouting. Use a method of cutting that does not damage the grout inside the casing.

J. Installation Records. Submit full length/depth installation records for each micropile installed to the Engineer. Submit the records within 24 hours after each micropile installation is complete. Record data on a micropile installation log as shown on page 8-14 of Report Number FHWA-NHI-05-039 Micropile Design and Construction Reference Manual. Use a separate installation log for each micropile.

5. Testing.

A. Grout Testing. Do not perform verification or proof load tests until the grout in the micropile has been in place for 3 days and has attained a compressive strength not less than 3000 psi.

During installation of production piles, make three 2-inch grout cubes from each plant each day of operation or per every 10 piles, whichever occurs more frequently. Test the grout cubes according to AASHTO T 106. The compressive strength will be determined from the average of the compressive strengths of the three grout cubes.

Immediately prior to pile grouting, measure grout density according to AASHTO T 133 or API RP-13B-1. Conduct at least one grout density test per pile.

Submit compressive strength and density test results to the Engineer within 24 hours of testing. If requested by the Engineer, make and test additional cubes to verify the 3-day compressive strength test, at no additional cost to the Department.

B. Micropile Testing. Perform verification and proof testing of micropiles according to ASTM D 1143, except as modified herein. Perform the testing under the direction of a Professional Engineer licensed in the State of Michigan. Summarize the test data in a report to be sealed by the Professional Engineer. Submit the report to the Engineer within 24 hours of each load test. Notify the Engineer in writing 3 working days prior to any load test. Do not perform load tests without a representative from the Department's Geotechnical Services Section being on site to witness the load test.

Do not exceed 80 percent of the following micropile structural elements during load testing: steel yield in tension, steel yield in compression, steel buckling in compression, and grout compressive strength. Costs associated with increasing the strength of the verification test pile structural elements above the strength required for production piles will be borne by the Contractor.

(1) Testing Equipment and Data Recording. Testing equipment includes, but is not limited to dial gauges, dial gauge supports, jack and pressure gauges, electronic load cell, reaction piles, and a reaction frame. The load cell is required only for the creep test portion of the verification test and proof test. Submit a written description of the load test setup and jack, pressure gauge and load cell calibration reports according to subsection c.2 herein. Design the testing reaction frame to be sufficiently rigid and of adequate dimensions to prevent excessive deformation of the testing equipment. Align the jack, bearing plates stressing anchorage such that unloading and repositioning of the equipment will not be required during the test. Apply the test load with a hydraulic jack and measure the load with a pressure gauge graduated in 50 psi increments or less. Use a jack and gauge with a pressure range not more than twice the anticipated maximum test pressure. Select a jack with ram travel sufficient to allow the test to be performed without repositioning during the test. Monitor the creep test load hold during verification tests and proof tests with both the pressure gauge and the electronic load cell. Use the load cell to accurately maintain a constant load hold during the creep test load hold increment of the verification test. Measure the pile top movement with a dial gauge capable of measuring to 0.001 inch and a travel sufficient to allow the test to be performed without having to reset the gauge. Align the gauge to be parallel to the axis of the micropile. Support the gauge

independent from the jack, pile or reaction frame. Use a minimum of four dial gauges evenly distributed around the test pile. Record the load test data.

(2) Verification Load Testing. Perform a pre-production verification load test to verify the design of the micropile and the construction methods used to install the micropile meet specifications. Do not use production piles as reaction piles during load tests. Unless otherwise specified on the plans, install one sacrificial verification test pile per structure. Install verification test piles at locations approved by the Engineer. The verification micropile must be identical to those used in production and installed using the same methods to be used for installing production piles.

Do not locate reaction piles closer than 5 feet to the verification pile. Reaction piles must meet the approval of the Engineer. Perform verification load tests by incrementally loading the micropile in compression according to Table 1. Depending on performance, the Engineer will determine whether a 10 minute or a 60-minute creep load hold is appropriate. If the pile top movement measured between 1 and 10 minutes exceeds 0.04 inches, maintain an additional 50 minutes of load hold during the creep test. Record pile top movements during each hold period at time intervals of 1, 2, 3, 4, 5, 6, 10, 20, 30, 50, and 60 minutes. Reset dial gauges to zero after the initial alignment load (AL) is applied. The acceptance criteria for micropile verification load tests are:

(a) Failure of the test pile does not occur before the maximum test load is applied. Failure is defined as the lesser of:

(i) The slope of the load versus deflection curve (at the end of the load increment) exceeds 0.025 inch/kip, or

(ii) Where attempts to further increase the test load simply results in continued pile movement.

(b) Test pile supports the nominal resistance (R_n) with not more than 1.00 inch of total vertical movement at the top of the pile from its position prior to testing.

(c) At the end of the creep test load period, a creep rate not greater than 0.04 inch/log cycle time (1 to 10 minutes) and not greater than 0.08 inch/log cycle time (6 to 60 minutes or the last log cycle if held longer) and linear or decreasing creep rate.

The Engineer will provide written approval or rejection of the micropile design and construction techniques within 7 working days of the completion of the verification load test.

Verification piles constructed using methods different from the methods submitted for production piles will be rejected and additional verification test pile(s) will be required at no additional cost to the Department. If the verification pile fails to meet the acceptance criteria, the Engineer may modify the design of the production piles or require the Contractor to make modifications to the construction methods, or both. Modifications may include, but not be limited to, modifying the installation methods,

increasing the bond length, or changing the micropile type. Any modification to the construction procedure that necessitates changes to the structure requires the Engineer's review and approval.

Do not install production piles until the verification load test results have been reviewed and accepted by the Engineer. At the completion of verification testing, remove testing equipment and remove test piles and reaction piles to an elevation directed by the Engineer.

Table 1: Verification Load Test Schedule

Step	Load (a)(b)	Hold Time, minutes	Step	Load (a)(b)	Hold Time, minutes
1	AL	-	19	AL	1
2	0.10 R_n	3	20	0.10 R_n	1
3	0.20 R_n	3	21	0.20 R_n	1
4	0.30 R_n	3	22	0.30 R_n	1
5	AL	1	23	0.40 R_n	1
6	0.10 R_n	1	24	0.50 R_n	1
7	0.20 R_n	1	25	0.60 R_n	1
8	0.30 R_n	1	26	0.70 R_n	1
9	0.40 R_n	3	27	0.80 R_n	3
10	0.50 R_n	3	28	0.90 R_n	3
11	AL	1	29	1.00 R_n	10
12	0.10 R_n	1	30	0.75 R_n	5
13	0.20 R_n	1	31	0.50 R_n	5
14	0.30 R_n	1	32	0.25 R_n	5
15	0.40 R_n	1	33	AL	5
16	0.50 R_n	1			
17	0.60 R_n	3			
18	0.70 R_n	10 or 60 (creep test)			

a. R_n denote nominal resistance.
b. AL denotes alignment load. AL is equal to 0.025 R_n.

(3) Proof Load Testing of Production Micropiles. Unless otherwise specified on the plans, perform proof load tests on one production pile per substructure unit or five percent of the production piles, whichever is greater. Do not install other production piles, except those designated for proof load testing, until the proof load test results have been reviewed and accepted by the Engineer. Repair damage to production proof load tested piles at no additional cost to the Department.

Perform proof load tests by incrementally loading the micropile in compression according to Table 2. Depending on performance, the Engineer will determine whether a 10 minute or a 60-minute creep load hold is appropriate. If the pile top movement measured between 1 and 10 minutes exceeds 0.04 inches, maintain an additional 50 minutes of load hold during the creep test. Record pile top movements during each hold period at time intervals of 1, 2, 3, 4, 5, 6, 10, 20, 30, 50, and 60 minutes. Reset dial gauges to zero after the initial alignment load (AL) is applied. The acceptance criteria for micropile verification load tests are:

(a) Failure of the test pile does not occur before the maximum test load is applied. Failure is defined as the lesser of:

(i) The slope of the load versus deflection curve (at the end of the load increment) exceeds 0.025 inch/kip, or

(ii) Where attempts to further increase the test load simply results in continued pile movement.

(b) Test pile supports the maximum test load with not more than 0.75 inches of total vertical movement at the top of the pile from its position prior to testing.

(c) At the end of the creep test load period, a creep rate not greater than 0.04 inch/log cycle time (1 to 10 minutes) and not greater than 0.08 inch/log cycle time (6 to 60 minutes or the last log cycle if held longer) and linear or decreasing creep rate.

If proof-tested micropile fails to meet the acceptance criteria, proof test another micropile within the same substructure unit as designated by the Engineer. For the failed piles and the construction of the remaining production piles, modify the construction methods. Modifications may include, but not be limited to, installing replacement piles; incorporating piles at not more than 50 percent of the maximum test load attained, post grouting; modifying installation methods; increasing the bond length; or changing micropile type. Any modification that necessitates changes to the structure design requires the approval of the Engineer. The cost of modifying construction methods, additional test piles, performing additional proof tests, and replacing production piles will be borne by the Contractor.

Table 2: Proof Load Test Schedule

Step	Load (a)(b)	Hold Time, minutes
1	AL	-
2	$0.10R_n$	3
3	$0.20R_n$	3
4	$0.30R_n$	3
5	$0.40R_n$	3
6	$0.50R_n$	3
7	$0.60R_n$	3
8	$0.70R_n$ (Max. Test Load)	10 or 60 (Creep Test Load Hold)
9	$0.55R_n$	5
10	$0.40R_n$	5
11	$0.25R_n$	5
12	$0.10R_n$	5
13	AL	5

a. R_n denotes nominal resistance.
b. AL denotes alignment load. AL is equal to $0.025R_n$

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

Pay Item **Pay Unit**

Micropile Mobilization, LRFD (Structure No.).....Lump Sum
Micropile, Type B, Furn and Install, LRFD .....Each
Micropile, Load Test, Proof, LRFD.....Each
Micropile, Load Test, Verification, LRFD.....Each

1. **Micropile Mobilization, LRFD (Structure No.)** will be measured as a unit for each structure. **Micropile Mobilization, LRFD (Structure No.)** includes furnishing and removing equipment for installing micropiles, making submittals, obtaining approval or acceptance from the Engineer for submittals, and maintaining installation records.

2. **Micropile, Type B, Furn and Install, LRFD** will be measured per each micropile installed and accepted by the Engineer. **Micropile, Type B, Furn and Install, LRFD** includes furnishing micropile materials, installing micropiles, and disposing of excess materials and spoils. Furnishing, fabricating, and installing connections to the structure will not be paid for separately but included in the payment for **Micropile, Type B, Furn and Install, LRFD**. No additional compensation will be given for drilling through obstructions or for grout overruns.

3. **Micropile, Load Test, Proof, LRFD** will be measured per each micropile tested and accepted. **Micropile, Load Test, Proof, LRFD** includes the testing apparatus, data collection and reports, sacrificial micropiles serving as reaction piles that are not production piles, repairing damage to production piles, and obtaining acceptance from the Engineer.

4. **Micropile, Load Test, Verification, LRFD** will be measured per each micropile tested and accepted. **Micropile, Load Test, Verification, LRFD** includes the testing apparatus, data collection and reports, the sacrificial micropiles serving as reaction piles that are not production piles, the sacrificial micropile on which the verification load test is being performed, and obtaining acceptance from the Engineer.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
POLYURETHANE JOINT SEALANT FOR STRUCTURES

STM:JD 1 of 2 APPR:JAB:TGH:03-27-23
FHWA:APPR:03-29-23

a. Description. This work consists of sealing construction joints on structures with polyurethane or polyurethane hybrid sealants at the locations shown on the plans, or as directed by the Engineer. Perform all work in accordance with the standard specifications and standard plans, except as modified in this special provision.

b. Materials. Furnish a solid, round, closed-cell, polyethylene foam backer rod meeting the requirements of *ASTM D5249, for Type 1*. Select a polyurethane or polyurethane hybrid sealant based on the performance requirements in Table 1 or as approved by the Engineer.

Table 1: Polyurethane or Polyurethane Hybrid Sealant Requirements

Property	Test Method	Minimum Result
Movement capability, %	*ASTM C719*	+35/-35
Tensile strength, psi	*ASTM D412*	175
Tear strength, pli	*ASTM D624*	35
Ultimate elongation at break, %	*ASTM D412*	400
Hardness, Shore A	*ASTM C661*	25
Tack-free time, hrs	*ASTM C679*	6
Adhesion in peel, pli	*ASTM C794*	20

Ensure non-sag polyurethane and polyurethane hybrids meet *ASTM C920, Type S, Grade NS, Class 35, Use NT, M, A, O*. Self-leveling polyurethane and self-leveling polyurethane hybrids are prohibited.

Furnish a general certification per the MDOT's *MQAP Manual* to the Engineer that the materials meet the requirements specified herein.

c. Construction.

1. Joint Preparation. Immediately prior to application of the polyurethane or polyurethane hybrid sealant, clean joint faces by abrasive blasting to remove all materials that may interfere with the bonding or curing of the sealant. Ensure the prepared joint faces meet the *International Concrete Repair Institute 310.2R, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays and Concrete Repair*, CSP 3. Use a vacuum or oil-free moisture-free air blast to remove all dust and other loose material. Remove any oil or other contamination after initial cleaning. Ensure there is no visible moisture present on the surface of the concrete at the time of application. Ensure that the fiber joint filler is

secure and installed at the proper elevation relative to the joint reservoir. Place backer rod to a depth of 1 inch or in accordance with the sealant manufacturer's recommendations.

2. Joint Sealing. Furnish the Engineer with manufacturer's recommended application procedures. Do not install sealant on concrete surfaces that are less than the age, specified by the manufacturer's recommendations. Recess the surface of the polyurethane or polyurethane hybrid sealant 1/2 inch. Install polyurethane or polyurethane hybrid sealant 1/2 inch thick. Do not place sealant if weather or surface conditions are such that the material cannot be properly handled, placed, and cured within the manufacturer's requirements and specified requirements of traffic control.

d. Measurement and Payment. Payment for sealing construction joints with polyurethane or polyurethane hybrid sealants in accordance with this special provision is considered included in other items of work in the contract.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
FINISHING AND CURING OF NIGHT CAST STRUCTURAL CONCRETE

BRG:JAB 1 of 1 APPR:NAP:BMW:08-06-20
FHWA:APPR:08-06-20

a. Description. This work consists of finishing and curing superstructure concrete paid for as night casting. Perform all work in accordance with the standard specifications and this special provision.

b. Materials. None specified.

c. Construction. Construct all work in accordance with the standard specifications and this special provision.

Ensure all superstructure concrete paid for as Superstructure Conc, Night Casting or Superstructure Conc, Night Casting, High Performance is finished with equipment meeting the requirements of subsection 706.03.A.2 of the Standard Specifications for Construction.

Ensure all superstructure concrete paid for as Superstructure Conc, Night Casting or Superstructure Conc, Night Casting, High Performance is cured in accordance with subsection 706.03.N.1.b of the Standard Specifications for Construction.

d. Measurement and Payment. All costs associated with this work is considered included in the associated form, finish, and cure pay items. No additional payment will be permitted.

CITY OF ANN ARBOR
DETAILED SPECIFICATION
FOR
EXPANSION JOINT COVER PLATE, MODIFIED

DLZ/CLH:COAA/FC 1 of 2 09/06/22

a. Description. This work shall include applying slip-resistant coating as described herein, and placing the cover plates after the slip-resistant coating has been applied.

b. Materials. Provide one of the following slip resistant coating systems:

1. Algrip
   Ross Technology Corp.
   104 N Maple Ave.
   Leola, PA 17540

2. Mebac # 3
   IKG
   1514 South Sheldon Road
   Houston, TX, 77015

3. Slipnot Grade 2, Steel
   W.S. Molnar Company
   2445 Beaufait St.
   Detroit, MI, 48207

Provide new hardware that meets the requirements of Section 908 of the 2020 Standard Specifications for Construction.

c. Construction.
The approved slip-resistant surface shall be applied in the manufacturer's shop. Apply the slip-resistant surface to steel substrate using an all metal plasma stream deposition process to bond the surface to the substrate, resulting in the primarily Martensitic steel surface having a random hatch matrix.

After the slip-resistant surface has been applied to the substrate, hot-dip galvanize the entire piece in accordance with ASTM A123.

Use the following limits during hot-dip galvanizing: when pickled in heated sulfuric acid solution, do not exceed 3 minutes immersion. When pickled in hydrochloric acid solution at ambient temperature, do not exceed 10 minutes immersion.

Do not apply slip-resistant surfacing to countersunk surfaces for countersunk bolts or other areas shown on the plans. Do not bend plates, bars, or shapes after the slip-resistant surface has been applied.

Replace defective or damaged slip-resistant surfaces as directed by the Engineer.

After the slip resistant coating has been applied, install the expansion joint cover plates.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the Contract Unit Price using the following Contract (Pay) Item:

Contract Item (Pay Item)	**Pay Unit**
Expansion Joint Cover Plate, Modified	Foot

Expansion Joint Cover Plate, Modified will be measured to the limits shown in the plans. Payment shall include all labor, shipping, material, and equipment required to apply the approved slip-resistant coating, galvanize, and install the cover plates.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
STRUCTURAL STEEL AND ALUMINUM CONSTRUCTION

STR:MJF 1 of 7 APPR:JSW:POJ:04-10-20
FHWA:APPR:04-13-20

a. Description. This special provision specifies the AWS Code year and associated revisions to the Code to be used for the project.

b. ***AASHTO/AWS D1.5M/D1.5:2015, Bridge Welding Code*** (hereafter called *AWS D1.5*). Ensure fabrication of structural steel bridge members is performed in accordance with *AWS D1.5* as modified herein:

2.8.8: Add the following sentence to the end of the existing paragraph:

An exception to this is for the case of a sole plate welded to the bottom flange of a beam or girder. In this case the welds must be continuous as shown on the contract drawings with corners ground to eliminate notches greater than 0.01 inch. Provide a smooth transition from the weld metal and base metal after grinding.

2.17.5.1: Change "….subject to tensile stress shall have a smooth transition…" to read "…subject to tensile and compressive stress must have a smooth transition…"

3.1.3: Change "...when the ambient temperature is lower than -20°C [0°F]..." to read "...when the ambient temperature is lower than 5 degrees C [40 degrees F]...".

3.2.1: Delete the existing paragraph in its entirety and replace with the following paragraph:

Surfaces and edges to be welded must be smooth, uniform, and free from fins, tears, cracks, all mill scale, and other discontinuities which would adversely affect the quality or strength of the weld. Surfaces to be welded and surfaces adjacent to a weld must also be free from loose or thick scale, slag, rust, moisture, grease, and other foreign material that would prevent proper welding or produce objectionable fumes.

All edges whether welded or not must be conditioned by very shallow grinding to remove the hardened layer left by resolidification.

3.13.3: Delete the existing paragraph in its entirety and replace with the following sentence:

Steel backing on welds must be removed and the joint must be ground smooth, unless otherwise directed by the Engineer.

3.13.6: Delete the word "copper" from the first sentence in the first paragraph and delete the second paragraph in its entirety.

4.1.4.1: Add the following sentence to the existing paragraph:

A filler metal log sheet must be available at all times for the Engineer to review.

4.2: Add the following sentence as a new paragraph:

Cooling welds using compressed air or water is not permitted.

4.2.5: Delete the word “-20°C [0°F]” in this subclause and replace with 5 degrees C [40 degrees F].

4.2.2: Add the following sentence:

For AASHTO M270 Grade 36, 50, 50W, and HPS 50W, the maximum preheat and interpass temperature must be 345 degrees C [650 degrees F].

4.6.8: The progression for all passes in the vertical position must be upward (including repairs).

4.13.1.7: The progression for all passes in the vertical position must be upward (including repairs).

Table 5.9: In the table under "1. Test on Plate" in the “Type of Weld” column, delete the “Fillet Option No. 2” and accompanying referenced Figure 5.22.

5.13: Delete the subclause in its entirety.

5.14: Delete the subclause in its entirety.

5.23.1.5: Delete the existing paragraph in its entirety and replace with the following paragraph:

Plug Weld Qualification Tests for Plug Welds Only. The joint must consist of a hole diameter the same size as that used in production in a plate the same thickness as that being welded. Backing must be of the same thickness and material as that to be used in production. In addition, Ultrasonic Testing (UT) inspection is required for plug weld qualification and must meet the requirements shown in Table 6.3. Conduct macroetch test according to subclause 5.27.6.2.

5.23.2.4(2)(b): Delete this subclause and accompanying referenced Figure 5.27.

5.27.1: In this subclause add the following requirements for visual inspection to the existing paragraph:

Discontinuities must not exceed 1/8 inch measured in any direction on the surface. Summation of all discontinuities exceeding 1/32 inch must not exceed 3/8 inch.

5.27.6.1: In this subclause add the following requirements to the existing requirements:

(7) Discontinuities must not exceed 1/8 inch measured in any direction on the surface.

(8) Summation of all discontinuities exceeding 1/32 inch must not exceed 3/8 inch.

5.27.6.2(3): Change "...in excess of 1/4 in [6 mm] total..." to read "... in excess of 1/8 inch [3 mm] total...".

6.3.1: Add the following sentence to the existing paragraph:

All WPSs are required to be approved by the Engineer prior to welding.

6.5.8: Add the following at the end of the existing paragraph:

Inspection and NDT records must contain at least the content and information shown in the sample forms of Annex O.

6.6.5: Add the following at the end of the existing paragraph:

Similarly, if such testing should disclose any deficiencies which require repair work, all costs associated with the original NDT and in addition to subsequent NDT for the repairs must be paid for by the Contractor.

6.7.7: Add the following at the end of the existing paragraph:

PT inspection must be performed at the ends of all CJP (butt, corner, and T) weld terminations for primary members.

6.7.8: Delete the existing paragraph in its entirety and replace with the following sentence:

Phased-array UT (PAUT) in accordance with the current MDOT PAUT Program document may be substituted for RT of complete joint penetration groove welds in butt joints.

6.19.8: Remove reference to Table 6.4.

6.20.1: Add the following at the end of the existing paragraph:

All discontinuities found by UT must be recorded on the NDT report.

6.26.2.1: In the first sentence, change "For welds subject to tensile stress under any condition of loading..." to read "For all welds under any condition of loading...".

6.26.2.2: Delete the subclause in its entirety.

6.26.3.1(1): Change "Welds subject to tensile stress under any condition of loading..." to read "Welds under any condition of loading...".

6.26.3.1(2): Delete this subclause in its entirety.

6.26.3.3: Change “Table 6.4” to “Table 6.3”.

6.26.3.3(2): Delete this subclause in its entirety.

12.6.4.1: Add the following to the paragraph:

Electrodes for SMAW must be E7018, E8018, E9018, E10018, and E11018.

12.7.5: Add the following to the end of the paragraph:

Evidence must include third-party CWI witnessing the test and RT film available for the Engineer's review. If this evidence cannot be provided all costs associated with the procedure qualification must be at the Contractor's expense.

12.16.5.1: Add the following sentence to the existing paragraph:

Inspection and NDT records must contain at least the content and information shown in the sample forms of Annex O.

12.18: Add this subclause to the code:

The Contractor must provide documentation of all visual and NDT for timely review and confirmation by the Engineer prior to the weldment being covered.

Table 12.2: Delete Note a.

c. ***AWS D1.1/D1.1M:2015, Structural Welding Code - Steel*** (hereafter called *AWS D1.1*). Fabrication of structural steel elements (e.g. steel sign support structures, tower lighting units, Closed-Circuit Television (CCTV) towers, traffic signal mast arms and poles, drainage components, expansion dams, curb plates, bearings, bridge railings, and other miscellaneous structural steel members as determined by the Engineer) must be performed in accordance *AWS D1.1* as modified herein.

Tubular fracture critical members must follow clause 12 of AWS D1.5 and specific provisions stipulated in the *AASHTO LRFD Guide Specification for Design of Pedestrian Bridges*.

3.5.2: Delete this subclause in its entirety and eliminate all references within *AWS D1.1* to alternate methods for establishing minimum preheat and interpass temperatures.

3.7.1: Delete the existing subclause in its entirety and replace with the following paragraph:

The progression for all passes in the vertical position must be upward including repairs.

4.2.1.3: Delete the existing subclause in its entirety and replace with the following paragraph:

Charpy impact tests and all weld metal tensile tests are required for all groove weld procedure test plates. Additional plate lengths are required for these tests. This requirement is for all steels greater than ½ inch in thickness, used for structural supports for highway signs, luminaires, and traffic signals, that are main load carrying tension members. Specimens tested for impact values must have a minimum value of 20 ft-lb at -20 degrees C [0 degrees F]. All weld tensile specimens must have values not less than those shown in Table 3.1 with elongation in 2 inch gage length not less than 22 percent.

Table 4.11: In the table under the Type of Test Weld column, delete the Fillet Option 2 and accompanying referenced Figure 4.22.

4.9.4.1(4): In this subclause add the following requirements to the existing requirements:

(e) Discontinuities must not exceed 1/8 inch measured in any direction on the surface.

(f) Summation of all discontinuities exceeding 1/32 inch must not exceed to 1/8 inch.

4.21.3: Delete this subclause in its entirety and replace with subclause 5.23.1.5 of *AWS D1.5* and as modified in section b herein.

4.22.2.1: Delete this subclause in its entirety and replace with subclause 5.23.1.5 of *AWS D1.5* and as modified in section b herein.

4.22.2.2: In this subclause add the following requirements to the existing requirements:

(4) Discontinuities must not exceed 1/8 inch measured in any direction on the surface.

(5) For discontinuities 1/32 inch or larger, accumulated discontinuity must not exceed 3/8 inch.

4.22.2.2(3)(c): Change "...in excess of 1/4 in [6 mm] total..." to read "...in excess of 1/8 inch [3 mm] total...".

Table 5.1: Delete and replace with Table 4.6 of *AWS D1.5*.

5.3.2.2: Delete the last sentence of this subclause and replace with subclause 4.5.2.2 of *AWS D1.5*.

5.3.2.3: Delete this subclause in its entirety and replace with subclause 4.5.2.1 of *AWS D1.5*.

5.11.2(1): In this subclause change "...when the ambient temperature is lower than 0°F [-20°C]..." to read "...when the ambient temperature is lower than 40 degrees F [5 degrees C]...".

5.13 Delete this subclause in its entirety and replace it with the last paragraph in subsection 707.03.C.2.a of the Standard Specifications for Construction.

5.25: Add the following sentences to the end of the existing paragraph:

Written weld repair procedures must be approved by the Engineer prior to any weld repairs.

6.1: Delete this subclause in its entirety and replace with subclause 6.1 of *AWS D1.5*.

6.3.3: Add the following sentence to the end of the existing paragraph:

Approved weld procedures are to be posted where work and welding are being performed.

6.5.4: Add the following sentence to the end of the existing paragraph:

Inspection and NDT records must contain at least the content and information shown in the sample forms of Annex M.

6.6.5: Delete this subclause in its entirety and replace with subclause 6.6.5 of *AWS D1.5* and as modified in section b herein.

6.9: In this subclause add the following requirements to the existing requirements:

No discontinuities exceeding 1/8 inch measured in any direction on the surface.

No discontinuities exceeding 3/8 inch - Sum of the greatest dimensions of all discontinuities exceeding 1/32 inch, but less than or equal to 1/8 inch.

6.12.2.1: In the title of this subclause, change "Cyclically Loaded Nontubular Connections in Tension" to read "Cyclically Loaded Nontubular Connections".

6.12.2.2 & Figure 6.3: Delete this subclause in its entirety and referenced Figure 6.3. See subclause 6.12.2.1 as modified herein.

6.13.2(1): Change "Welds subject to tensile stress under any condition of loading..." to read "All welds under any condition of loading...".

6.13.2(2) & Table 6.2: Delete this subclause in its entirety and referenced Table 6.2. See subclause 6.13.2(1) as modified herein.

6.19.2: In the third sentence of the paragraph, replace the word “painted” with the word “coated”.

6.25.3: Replace the word “paint” with “coatings”.

9.15.4.1(3)(f): Change "exceed 1/4 in [6 mm]" to read "exceed 1/8 inch [3 mm]".

9.15.4.1(3): In this subclause add the following requirements to the existing requirements:

(g) Discontinuities must not exceed 1/8 inch measured in any direction on the surface.

(h) Summation of all discontinuities exceeding 1/32 inch must not exceed to 1/8 inch.

d. ***AWS D1.2/D1.2M:2014, Structural Welding Code – Aluminum*** (hereafter referred to as *AWS D1.2*). Fabrication of structural aluminum must be performed in accordance with *AWS D1.2*.

3.5.3: Delete this subsection in its entirety.

3.6.3: Add the following requirements to the existing requirements:

(8) No discontinuities exceeding 1/8 inch measured in any direction on the surface.

(9) No discontinuities exceeding 3/8 inch - Sum of the greatest dimensions of all discontinuities exceeding 1/32 inch, but less than or equal to 1/8 inch.

3.11: Delete this subsection in its entirety.

3.21.6.3: Delete this subsection in its entirety and replace with the sentence:

RT must not be used in lieu of the bend test for qualification testing of welders or welding operators.

5.6.5: Delete this subsection in its entirety and replace it with subclause 6.6.5 of *AWS D1.5*

and as modified in section b herein.

CITY OF ANN ARBOR
DETAILED SPECIFICATION
FOR
STRUCTURAL STEEL GALVANIZING

DLZ/CLH:COAA/FC 1 of 2 09/07/22

a. Description. This work includes removing the existing rolled steel beams, transporting the existing beams from the East Medical Center Drive over NS RR structure to a fabricator, cleaning, galvanizing, storing, and re-erecting the beams on the East Medical Center Drive structure.

b. Materials.

1. Cleaning. Clean existing rolled steel beams according to section 716.03A of the MDOT 2020 Standard Specifications for Construction.

2. Galvanizing. Galvanize existing rolled steel beams according to section 716.03B.4 of the MDOT 2020 Standard Specifications for Construction.

c. Construction.

Remove the existing rolled steel beams from the structure and transport them to a fabrication shop in a manner that does not damage the beams.

Clean and install bolted steel repairs, as detailed on the plans.

After cleaning and repairs have been completed, transport the existing rolled steel beams to a galvanizer. Galvanize the beams according to the MDOT 2020 Standard Specifications for Construction.

Bridge construction shall be completed part-width. Existing Beam E will be removed during Construction Stage 2, but not re-erected until Construction Stage 3. Existing Beam E will be stored offsite, in a secured location until the existing beams are re-erected during Construction Stage 3.

After cleaning, repairing, and galvanizing are completed, transport the existing beams to the structure and re-erect, as detailed on the plans.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the Contract Unit Price using the following Contract (Pay) Item:

Contract Item (Pay Item)	**Pay Unit**
Structural Steel Galvanizing (Str No.)	LSUM

Structural Steel Galvanizing (Str No.) payment shall include all labor, transportation, material, and equipment required to remove, clean, galvanize, store, and re-erect the existing rolled steel beams. The payment for repairing the beams will be included in the bid items **"Structural Steel, Mixed, Erect"** and **"Structural Steel, Mixed, Furn and Fab"**.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
SUBSTRUCTURE HORIZONTAL SURFACE SEALER

STM:JD 1 of 2 APPR:JAB:MTH:06-01-21
FHWA:APPR:06-03-21

a. Description. This work consists of preparing the substrate concrete surface, furnishing and applying a penetrating epoxy healer/sealer system to the top horizontal surface of concrete pier caps, abutment bridge seats, and other locations as specified on the plans. The standard specifications apply except as modified herein.

b. Materials. Use solvent-free, moisture insensitive, 100 percent solids, and two-component epoxy based healer sealer. Ensure containers are marked clearly “Part A” or “Part B”. The epoxies that are approved for substructure horizontal surface sealers are in Table 1.

Table 1: Approved Two Component 100 Percent Solids Epoxy Based Healer Sealers

Supplier	Product	Telephone
Advanced Chemical Technologies	SIL-ACT EP 1000 HM	(405)-843-2585
E-Chem	EP100	(505) 217-2121
Euclid Chemical	Dural 335 Dural 50 LM	(800) 321-7628
Poly-Carb	Mark 127	(817) 797-1113
Sika	Sikadur 55 SLV	(248) 866-8956
Unitex	Pro-Poxy 40 LV LM	(800) 745-3700

c. Construction. Prepare surface and apply substructure horizontal surface sealer in accordance with the manufacturer’s recommendations, except as modified by this special provision.

1. Surface Preparation. Ensure patching and cleaning operations are inspected and approved by the Engineer prior to surface sealer installation. Protect utilities, drainage structures, bearings, beams, vertical surfaces of substructure units and any other structure within or adjacent to the surface sealer location from surface preparation activities and application of the surface treatment materials.

Do not perform surface preparation or installation of surface sealer on concrete that is less than 28 days of age. Clean the entire concrete surface by abrasive blasting to remove all materials that may interfere with the bonding or curing of the binder. Water blasting or wire brushing is prohibited. The cleaned concrete surface must meet the *International Concrete Repair Institute Guideline 310.2R, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays and Concrete Repair*, concrete surface profile (CSP) 3. Ensure mortar is sound and sufficiently bonded to the coarse aggregate, and presents a

uniform CSP necessary for adequate bond. Use a vacuum truck or oil-free moisture-free air blast to remove all dust and other loose material. Brooms are prohibited. Remove any oil or other contamination after initial cleaning.

No visible moisture can be present on the surface of the concrete at the time of healer sealer application. Oil-free moisture-free compressed air may be used to dry the concrete surface. Use a plastic sheet left taped in place in accordance with *ASTM D4263* to identify moisture in the healer sealer area except as modified herein. Tape a 18 inch by 18 inch transparent polyethylene sheet (4 mil) to the concrete surface. Ensure all edges are sealed with tape that will stick to the concrete substrate. Leave the plastic sheet in place for a minimum of 3 hours or as directed by the manufacturer's recommendations for cure time for the conditions, whichever is longer. Ensure there is no moisture visible on the polyethylene sheet. Ensure alternate methods to detect moisture are approved by the Engineer.

2. Application. Apply the substructure horizontal surface sealer in accordance with the manufacturer's recommendations.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

Pay Item	**Pay Unit**
Substructure Horizontal Surface Sealer (Structure Identification)	Square Yard

No compensation will be made to the Contractor for surplus materials.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
THIN EPOXY POLYMER BRIDGE DECK OVERLAY

STM:JD 1 of 5 APPR:JAB:MTH:04-28-21
FHWA:APPR:04-28-21

a. Description. This work consists of cleaning/preparing entire deck surface and applying a two-coat epoxy overlay. Ensure all work is completed in accordance with section 712 of the Standard Specifications for Construction except as modified herein. Bring any discrepancies between the two to the attention of the Engineer

b. Materials. Use a solvent-free, moisture insensitive, 100 percent solids, low-modulus, and two-component epoxy system to overlay the structure. Ensure containers are marked clearly "Part A" or "Part B". The epoxies that are approved for thin overlays are in Table 1.

Table 1: Approved Two Component 100 Percent Solids Epoxy Systems

Supplier	Product	Telephone
BASF	MasterSeal 350	(800) 433-9517
E-Bond	526 Lo-Mod	(616) 532-0782
E-Chem	EP50	(505) 217-2121
Euclid Chemical	Flexolith Flexolith Summer Grade Flexolith HD	(800) 321-7628
Poly-Carb	Flexogrid Mark – 163 Flexogrid Mark - 154	(817) 797-1113
Sika	Sikadur 22-Lo Mod	(248) 866-8956
Transpo	T-48 Chip Seal	(573) 808-1040
Unitex	Propoxy Type III DOT	(800) 745-3700

Ensure aggregate meets the gradation requirements in Table 2 and has a hardness of seven or higher on the Mohs hardness scale. Ensure aggregate is angular, consists of natural silica sand, basalt, or other nonfriable aggregate, and contains less than 0.2 percent moisture when tested in accordance with *ASTM C566*.

Table 2: Angular Aggregates Gradation Requirements

Sieve Size	Minimum % Passing	Maximum % Passing
3/8	100	100
4	98	100
8	30	75
16	0	5
30	0	1
Pan	0	0

Provide general certification per the *MQAP Manual* to the Engineer that the aggregate meets the requirements specified herein.

c. Equipment. For the epoxy overlay, provide a distribution system or distributor capable of accurately blending the epoxy resin and hardening agent, and uniformly and accurately applying the epoxy materials at the specified rate to the bridge deck in such a manner as to cover 100 percent of the work area including 1 inch of the vertical face of curb/barrier. Provide a fine aggregate spreader capable of uniformly and accurately applying dry aggregate to cover 100 percent of the epoxy material. Provide a self-propelled vacuum truck.

For hand applications, provide calibrated containers, a Jiffy® type mixer, and notched squeegees which are suitable for mixing and applying the epoxy and aggregate.

For mechanical applications, provide mixing equipment that will automatically and accurately proportion the components in accordance with the manufacturer's recommendations, mix and continuously place the epoxy overlay. Ensure the operation proceeds in such a manner that will not allow the mixed material to segregate, dry, be exposed or otherwise harden in such a way as to impair the retention and bonding of broadcasted aggregate.

d. Construction.

1. Surface Preparation. The Engineer will inspect patching and cleaning operations. The Engineer's approval is required prior to placement of the overlay. Protect utilities, drainage structures, curbs, bridge joints, and any other structure within or adjacent to the epoxy overlay from surface preparation activities and application of the surface treatment materials. For the purposes of this special provision, the term *bridge joints* does not include sawed construction joints.

Verify that the compressed air used for any work is free of oil and moisture contamination in accordance with *ASTM D4285*. Use either an absorbent or a nonabsorbent white collector positioned within 24 inches of the air-discharge point, centered in the air stream. Allow air to discharge onto the collector for a minimum of 1 minute. Visually examine the collector for the presence of oil and/or water. Conduct the test at least one time per shift for each compressor system in operation in the presence of the Engineer. If air contamination is evident, make adjustments to achieve clean, dry air. Examine the work performed since the last acceptable test for evidence of defects or contamination due to contaminated compressed air. Repair contaminated work at no additional cost to the contract.

Do not perform surface preparation or installation of epoxy overlay on concrete less than 28 days of age. Ensure that traffic paint lines and surface texturing or grooving are removed. Clean the entire concrete surface by abrasive blasting or shotblasting to remove all materials that may interfere with the bonding or curing of the binder. The cleaned concrete surface must meet the *International Concrete Repair Institute Guideline 310.2R, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays and Concrete Repair,* concrete surface profile (CSP) 7. To ensure prepared surface is adequate for epoxy adhesion, perform a direct tension test per *ASTM C1583/C1583M*. Perform one direct tension test for every 400 square yards of overlay area. Minimum bond strength must be 250 psi for the surface preparation to be considered adequate. Use a vacuum truck or oil-free moisture-free air blast to remove all dust and other loose material. Brooms are prohibited. Remove any oil or other contamination after initial cleaning.

Ensure both courses of epoxy overlay are applied within 24 hours of the final cleaning, and prior to opening the area to traffic.

No visible moisture can be present on the surface of the concrete at the time of epoxy overlay application. Oil-free moisture-free compressed air may be used to dry the deck surface. Use a plastic sheet left taped in place in accordance with *ASTM D4263* to identify moisture in the epoxy overlay area except as modified herein. Tape an 18 inch by 18 inch transparent polyethylene sheet (4 mil) to the deck every 500 square feet. Ensure all edges are sealed with tape that will stick to the concrete substrate. Leave the plastic sheet in place for a minimum of 3 hours or the manufacturer's recommended cure time for the conditions, whichever is longer. Ensure there is no moisture visible on the polyethylene sheet. Ensure alternate methods to detect moisture are approved by the Engineer.

Remove all debris from the bridge joints. Protect the bridge joints, and any other areas not to be overlaid, from damage during preparation of the surface. Ensure the protection is removed once the epoxy and aggregate has been applied and prior to initial set. Ensure removing the protection is done soon enough to in no way harm the adjacent overlay. Ensure protection is applied again prior to the second coat and removed again prior to initial set as to not damage adjacent surfaces. Ensure the protection meets the approval of the Engineer.

2. Application. Ensure handling and mixing of the epoxy resin and hardening agent is performed in a safe manner to achieve the desired results in accordance with the manufacturer's recommendations for a two-coat system or as directed by the Engineer. Do not place epoxy overlay materials when the concrete surface is less than 50 ºF or ambient air temperature is forecast to fall below 50 ºF within 8 hours of application. Do not place epoxy overlay materials if weather or surface conditions are such that the material cannot be properly handled, placed, and cured in accordance with the manufacturer's requirements and the specified requirements of traffic control.

Apply the epoxy overlay in two separate courses in accordance with the manufacturer's recommendation for a two-coat system with the following rate of application. Ensure the first course is no less than 2½ gallons per 100 square feet. Ensure the second course is no less than 5 gallons per 100 square feet.

Ensure application of aggregate to both the first and second courses is of sufficient quantity so the entire surface is covered in excess. Ensure no bleed through, or wet spots are visible in the overlay. Remove and replace any areas within course applications with wet spots or where epoxy has bled through.

After the epoxy mixture has been prepared for the overlay, immediately and uniformly apply it to the surface of the bridge deck with a notched squeegee. Apply the dry aggregate in such a manner as to cover the epoxy mixture completely within 5 minutes. Minimize all foot traffic on the uncured epoxy and ensure any foot traffic will only be done with steel spiked shoes approved by the Engineer. Cure each course of epoxy overlay until vacuuming or brooming can be performed without tearing or damaging the surface. Do not allow traffic or equipment on the overlay surface during the curing period. Remove by vacuuming or brooming all loose aggregate after the first course curing period. Immediately apply the next overlay course to complete the overlay. Ensure the minimum curing periods are in accordance with the manufacturer's recommendations, as shown in Table 3, or as directed by the Engineer. Remove by vacuuming or brooming all loose aggregate after the second course curing period.

Ensure all bridge joints are free of loose aggregate, epoxy and other debris resulting from overlay operations. Excess aggregate may be reused if it is clean, dry, free from foreign matter, and meets gradation requirements. Blend the excess aggregate at a ratio of 3 parts virgin material to 1 part recycled material. Inspect aggregate recovery equipment prior to reclamation operation to prevent the introduction of foreign material. Collect excess aggregate within 24 hours of placement. Do not collect excess aggregate that has been rained on or driven on.

Table 3: Anticipated Cure Time (Hours)

Average Temperature of Deck, Epoxy and Aggregate Components, ºF	1st Course	2nd Course
<60		(a)
60-64	2	2
65-69	2	2
70-74	1.75	1.75
75-79	1.75	1.75
80-84	1.5	1.5
>85	1	1
a. Second course must be cured for minimum of 8 hours if the air temperature drops below 60 ºF during the curing period, or per the manufacturer's recommendations.		

Plan and execute the work to provide the minimum curing periods as specified in Table 3, or other longer minimum curing periods as recommended by the manufacturer prior to opening to public or construction traffic, unless otherwise permitted. Ensure first course applications are not opened to traffic. Remove any contamination, detrimental to adhesion of the second course, from the first course at Contractor's expense prior to the application of the second course.

Remove and replace any areas damaged or marred by the Contractor's operations in accordance with this special provision. All cost associated with this work will be borne by the Contractor.

Remove and replace areas as directed by the Engineer and in accordance with 20SP-712D – Removal of Thin Epoxy Polymer Bridge Deck Overlay.

Provide the Engineer with all records including, but not limited to, the following for each batch provided:

- batch numbers and sizes,
- location of batches as placed on deck, referenced by stations,
- epoxy yield, referenced by stations
- batch time,
- temperature of air, deck surface, epoxy components, including aggregates,
- loose aggregate removal time, and
- time open to traffic.

3. Clean Up. At the end of the project or a minimum 7 days after the epoxy polymer overlay has cured, remove, and dispose all loose aggregate that has shed from the epoxy binder by vacuuming or brooming. Do not re-use this aggregate.

e. Measurement and Payment. The completed work, as described, will be measured and

paid for at the contract unit price using the following pay item:

Pay Item	Pay Unit
Epoxy Ovly	Square Yard

Epoxy Ovly includes preparing and cleaning the concrete surface, preparing and applying a two-coat epoxy overlay system on the concrete surface, and including miscellaneous clean-up. This pay item also includes cleaning and protecting bridge joints.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
GUARDRAIL APPROACH TERMINAL, TYPE 2M

GCB:CT 1 of 3 APPR:CAL:DBP:04-02-20
FHWA:APPR:04-03-20

a. Description. This work consists of furnishing and delivering a tangent *Manual for Assessing Safety Hardware* (MASH), Test Level 3 (TL-3) compliant guardrail approach terminal (Type 2M), selected from those listed herein, to the job site; submitting detailed drawings and installation manuals for the selected terminal(s) to the Engineer; and installing the device(s) as shown on the plans or as directed by the Engineer. Complete this work in accordance with manufacturer's details and specifications, and this special provision.

b. Materials. Select from the following guardrail approach terminals.

1. MSKT, manufactured by Road Systems, Inc.

2. Soft-Stop, manufactured by Trinity Highway Products, LLC.

3. MAX-Tension, manufactured by Lindsay Transportation Solutions, Inc.

Ensure all posts within the terminal limits are made of steel. Provide materials for the selected terminal(s) meeting manufacturer's specifications and the requirements of this special provision. Ensure the selected guardrail terminal meets MASH, TL-3 criteria and has an FHWA federal aid eligibility letter.

Provide detailed drawings of the selected guardrail approach terminal(s) prepared by the respective guardrail approach terminal manufacturer(s). The drawings must contain details depicting the terminal attached to MDOT Type MGS-8 guardrail, detailed in Standard Plan R-60-Series.

Provide materials meeting the requirements of subsection 807.02 of the Standard Specifications for Construction for transitions required for connecting Guardrail Approach Terminal, Type 2M to Type B or Type T guardrail, as depicted in Standard Plan R-60-Series.

Provide installation and maintenance manuals for the selected guardrail approach terminal(s) prepared by the respective guardrail approach terminal manufacturer(s).

Provide high intensity adhesive reflective sheeting for placement on the terminal's impact head. The reflective sheeting must meet the stripe dimensions, colors, and pattern, based on traffic conditions, as shown on Standard Plan R-62-Series. The three-inch stripes, alternating black and yellow, on the reflective sheeting must slope downward at an angle of 45 degrees toward the roadway. The yellow stripes on the reflective sheeting must meet *ASTM D4956* specifications for Type XI retroreflective sheeting and must meet the requirements of Section 2C.64 and 2C.65 of the *MMUTCD*.

c. Construction. At least 14 days prior to terminal installation, provide the Engineer one electronic copy of the detailed drawings, installation manuals, and maintenance manuals for the selected guardrail approach terminal(s). Before terminal installation commences, ensure all questions, comments, or concerns raised by the Engineer concerning the detailed drawings, installation manuals, and/or maintenance manuals are addressed.

The Contractor must ensure that the guardrail terminal manufacturer is available to consult, by telephone or e-mail, with the Engineer, the Engineer's designated representative, at no additional cost to the Department. Consultation will encompass the installation of guardrail terminals. Provide the manufacturer's name, telephone number, and e-mail address to the Engineer prior to terminal installation. Provide responses from the manufacturer to any telephone or e-mail inquiries from the Engineer, the Engineer's designated representative, within 2 working days.

Provide staff that have been trained by the respective guardrail terminal manufacturer to install the guardrail terminals utilized on the project. Training materials and course content for guardrail installation crew training will be as determined by the respective manufacturer. Provide manufacturer issued and dated training certificates for all staff on the guardrail installation crew. Training must have occurred within the previous 3 years. Ensure training certificates are provided to the Engineer 14 days before guardrail installation work commences. Provide updated training certificates no later than 48 hours after personnel changes occur.

Construct guardrail terminals in accordance with section 807 of the Standard Specifications for Construction, the manufacturer's installation manual(s), and the detailed drawings provided by the manufacturer.

Construct transitions for connecting Guardrail Approach Terminal, Type 2M to Type B or Type T guardrail in accordance with the appropriate details on Standard Plan R-60-Series and section 807 of the Standard Specifications for Construction.

Do not attach reflectors or other attachments within the limits of the guardrail approach terminal. Attach guardrail reflectors within the limits of transition sections, detailed on Standard Plan R-60-Series, when connecting Guardrail Approach Terminal, Type 2M to guardrail Type B or Type T.

Unless otherwise specified by the Engineer, install guardrail approach terminal with a 1 foot-0 inch offset, in relation to the rear of the terminal, measured at the nose (front) of the terminal.

Completely cover the portion of the impact head assembly facing traffic with high intensity adhesive reflective sheeting meeting the requirements of this special provision.

Provide the guardrail terminal manufacturer's installation checklist, completed and signed by the Contractor, for each individual guardrail terminal installed. Upon completion of guardrail work, provide written certification from the Contractor that all guardrail terminal installations have been installed per the contract and the manufacturers' specifications and guidelines.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

Pay Item	**Pay Unit**
Guardrail Approach Terminal, Type 2M	Each

Guardrail Approach Terminal, Type 2M includes furnishing and installing a guardrail approach terminal meeting the requirements of this special provision.

Payment for **Guardrail Approach Terminal, Type 2M** includes all materials, labor, and equipment within the length of each terminal, as defined in subsections d.1, d.2, and d.3 of this special provision, and also includes payment for all materials, labor, and equipment required to construct a transition section, per Standard Plan R-60-Series, for connecting Guardrail Approach Terminal, Type 2M to guardrail Type B or Type T.

The lengths specified in subsections d.1, d.2, and d.3 of this special provision do not include a transition section, per Standard Plan R-60-Series, for connecting Guardrail Approach Terminal, Type 2M to guardrail Type B or Type T.

1. MSKT. Overall length is 59 feet, 4½ inches, measured from Post 1.

2. Soft-Stop. Overall length is 50 feet, 9½ inches, measured from Post 0.

3. MAX-Tension. Overall length is 55 feet, ½ inch, measured from the soil anchor.

If the pay item lengths defined in this special provision conflict with the pay item lengths specified in the manufacturer's details and/or specifications, the pay item lengths defined in this special provision will take precedence.

Payment for all consultations between the manufacturer and the Engineer, the Engineer's designated representative, and/or Contractor, preparing and submitting detailed drawings, installation manuals, operation/maintenance manuals, and other required documentation will be included as part of this pay item, and will not be paid for separately.

The required reflective sheeting on the impact head is included as part of this pay item, and will not be paid for separately.

Unless otherwise specified by the Engineer, payment will be made after guardrail terminal installation has been completed and all required documentation has been submitted to the Engineer.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
TEMPORARY PEDESTRIAN PATH

COS:CRB 1 of 2 APPR:MRB:CAL:06-25-21
FHWA:APPR:06-28-21

a. Description. This work consists of furnishing, installing, maintaining, and removing a temporary pedestrian path as identified in the proposal or on the plans. Temporary pedestrian paths, or segments thereof, will be repaired or replaced as directed by the Engineer.

b. Materials. Provide materials to construct a temporary pedestrian path in accordance with the contract, the *Public Rights-of-Way Accessibility Guidelines (PROWAG)*, the *MMUTCD*, as directed by the Engineer, and the following requirements:

1. Ensure the materials used to construct the temporary pedestrian path yields a continuous hard surface that is firm, stable and slip resistant. Ensure the path does not warp, buckle or otherwise become uneven, and materials support the weight of pedestrians as well as motorized scooters and wheelchairs. Suitable materials to construct the path include asphalt materials, Oriented Strand Board (OSB), plywood, dimensional lumber, reclaimed, or other as approved by the Engineer. Compacted soils, aggregate and sand are prohibited.

2. If asphalt materials are not used to construct the path, provide an antiskid coating, or surface treatment as directed by the Engineer.

c. Construction. Construct the temporary pedestrian path in accordance with *PROWAG*, the *MMUTCD*, the contract, the direction of the Engineer, and the following:

1. Ensure the useable surface of the path is a minimum of 48 inches wide. The maximum cross slope for the path is 2 percent. The path, including transitions to the adjacent surface at both ends, must be free of vertical discontinuities greater than 1/4 inch. Eliminate any vertical discontinuities greater than 1/4 inch up to 1/2 inch or bevel with a slope not steeper than 1:2. If a vertical discontinuity greater than 1/2 inch or a running slope greater than 1:20 occurs on the project, a Temporary Pedestrian Ramp (paid for separately) is required.

A. Ensure an anti-slip surface treatment is applied to the surface of the path, if not constructed with asphalt materials, as directed by the Engineer.

B. If the surface of the path is constructed from OSB, plywood, or dimensional lumber securely connect all sections with appropriate fasteners to ensure a continuous, uniform, and flat surface.

C. Ensure the temporary pedestrian path includes passing spaces at intervals of 200 feet maximum. The passing spaces are to be of the same material as the rest of the temporary pedestrian path. Dimension the passing spaces with a minimum width of 60 inches and minimum length of 60 inches. Passing spaces are not required if the path is already 60 inches wide.

2. Ensure all debris and construction material is cleared from the path throughout its use. Ensure snow and ice is removed; the use of an approved de-icing agent may be required.

3. Repair or replace the path, or segments thereof, if it becomes uneven, unstable, or displaces due to weather events, construction activities, or other causes as directed by the Engineer.

4. Following the use of the temporary path, the Contractor must remove and dispose all materials used to construct the path, and restore the area as directed by the Engineer.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

Pay Item	**Pay Unit**
Pedestrian Path, Temp	Foot

Pedestrian Path, Temp will be measured along the centerline of the path. **Pedestrian Path, Temp** includes all costs related to installation, maintenance, restoration, and removal of the path and disposal of all associated materials throughout the life of the contract. Temporary passing spaces are considered a part of the pedestrian path and are included in this pay item.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
TEMPORARY PEDESTRIAN RAMP

COS:CRB 1 of 2 APPR:MRB:CAL:02-09-21
FHWA:APPR:02-18-21

a. Description. This work consists of furnishing, installing, maintaining, relocating, and removing a temporary pedestrian ramp as identified in the proposal or on the plans. Use temporary pedestrian ramps to facilitate pedestrian travel on accessible facilities over curbs or other uneven terrain features with a vertical difference of 1/2 inch or greater. Damaged pedestrian ramps will be replaced as directed by the Engineer.

b. Materials. Provide materials to construct a temporary pedestrian ramp in accordance with the *Americans with Disabilities Act (ADA)*, *MMUTCD,* the standard specifications, and the following:

1. Ensure the material used to construct the temporary pedestrian ramp is firm, stable, slip resistant, and forms a continuous hard surface. Ensure the surface does not warp, buckle, or otherwise become uneven, and materials support the weight of pedestrians as well as motorized scooters and wheelchairs. Suitable materials to construct the surface of the ramp include asphalt materials, Oriented Strand Board (OSB) or plywood, dimensional lumber, certain reclaimed or other materials as approved by the Engineer. Compacted soils, aggregate and sand are prohibited.

2. Provide a handrail on both sides of the ramp if the ramp is not exposed to vehicle traffic and has a total rise greater than 6 inches, and a length greater than 72 inches. Ensure the handrail is between 1.25 and 1.5 inches wide and configured to be a “graspable” cross-section. See subsection c.1.A of this special provision for additional details. When the ramp is exposed to traffic, in lieu of handrails, use a protective edge 2.5 inches minimum height above the ramp surface or 1:10 flare on both sides of the ramp.

3. Ensure the surface of the ramp is free draining; in addition, provide features that allow drainage to move past the ramp installation (i.e. along the gutter pan underneath the ramp if the ramp is installed on a curb).

4. Provide materials to construct detectable edging along open sides of the ramp if required.

5. If asphalt materials are not used to construct the surface of the ramp, provide an anti-slip coating or surface treatment approved by the Engineer.

c. Construction. Construct the temporary pedestrian ramp in accordance with the manufacturer’s recommendations (if applicable), *ADA*, *MMUTCD*, the plans, and the following:

1. Ensure the useable surface of the ramp is 48 inches wide and does not deflect due to pedestrian traffic. Ensure an anti-slip surface treatment is applied to the useable area of the

ramp if it is not made from asphalt materials. The maximum cross slope of the ramp is 2 percent. Ensure both ends of the ramp smoothly transitions to the adjacent surface, with 1/4 inch or less vertical difference.

Construct the ramp to maintain a longitudinal slope from 1:10 to 1:12 where possible. Otherwise, a longitudinal slope from 1:8 to 1:10 may be used for a maximum rise of 3 inches. Temporary pedestrian ramps with longitudinal slopes greater than 1:8 are prohibited.

A. Provide a handrail on both sides of the ramp if required as stated herein. Ensure the top of the handrail is between 34 and 38 inches above the surface of the ramp. Ensure a minimum width of 36 inches is maintained between the handrails, with a minimum clearance of 1.5 inches behind and 18 inches above.

Construct a structurally stable handrail that meets the requirements as defined in the *ADA* and *MMUTCD*.

2. Construct a detectable edging anytime a handrail is required, and anytime the path changes direction. This includes a turn onto the ramp from the path. Detectable edging must begin a maximum of 2.5 inches above the ramp surface and extend at least 6 inches above the ramp surface.

3. Ensure a clear space (minimum 48 inches by 48 inches) is provided above and below the ramp.

4. Avoid locating ramps in areas of drainage collection, ponding or running water, which can produce slippery or unsafe conditions. If the ramp is located over a gutter pan or other drainage structure, provide features to facilitate water movement around or under the ramp as approved by the Engineer.

5. Ensure all debris and construction material is cleared from the surface of the ramp throughout its use. Ensure snow and ice is removed; the use of an approved de-icing agent may be required. Repair or replace the ramp if it becomes uneven, unstable, or displaces due to weather events, construction activities, or other causes as directed by the Engineer.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

Pay Item	**Pay Unit**
Pedestrian Ramp, Temp	Each

Pedestrian Ramp, Temp includes furnishing, installing and removing a temporary pedestrian ramp at the locations shown on the plans, as well as all costs for maintaining, clearing debris, deicing, reconfiguring, and relocating the temporary pedestrian ramp throughout the life of the contract.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
TEMPORARY CONCRETE BARRIER, LIMITED DEFLECTION FURNISHED AND OPERATED

a. Description. This work consists of furnishing, installing, maintaining, operating, and removing limited deflection temporary concrete barrier (TCB) and connections meeting the requirements of Standard Plan R-53 Series or, if approved by the Engineer, alternative limited deflection temporary barrier systems meeting the requirements of this special provision. All barrier sections and connections must conform to the requirements of this special provision.

b. Alternatives to Standard Plan R-53 Series. Alternative limited deflection temporary barrier systems not conforming to Standard Plan R-53 Series will only be permitted after receiving approval by the Engineer for use at each proposed installation site.

Ensure alternative limited deflection temporary barrier systems meet the requirements of *National Cooperative Highway Research Program Report 350* (*NCHRP 350*), Test Level 3 (TL-3) or *Manual for Assessing Safety Hardware* (*MASH*), Test Level 3 (TL-3). Ensure alternative limited deflection temporary barrier systems are adequate for installation at each location taking site-specific features and constraints into consideration, including, but not limited to, proposed barrier offset from the drop-off, underlying surface type, and expansion joints in the underlying surface. Provide a letter from the Federal Highway Administration (FHWA) specifying that the alternative limited deflection temporary barrier system is eligible for federal aid reimbursement.

Ensure alternative limited deflection temporary barrier systems are fabricated and installed as successfully crash tested under *NCHRP 350*, TL-3 or *MASH*, TL-3, or with modifications approved by FHWA. If the proposed alternative temporary barrier system has any modifications from the version that was successfully crash tested, obtain a signed letter from FHWA specifying that the modified limited deflection temporary barrier system is eligible for federal aid reimbursement. Provide a copy of the signed FHWA letter to the Engineer.

Submit requests for alternatives to Standard Plan R-53 Series, along with any shop drawings and supporting documents, to the Engineer at least 30 days prior to limited deflection temporary barrier installation. The Department will require up to 30 days for reviewing and approving each request. The Contractor must address any questions, comments, or concerns raised by MDOT personnel.

Alternative limited deflection temporary barrier systems that, as determined by the Engineer, may have an adverse effect on the underlying surface or other roadway features, or are deemed unacceptable for any reason, will be rejected.

The Department reserves the right to reject any proposed alternatives to Standard Plan R-53 Series, at the Department's discretion, and at no additional cost to the contract. Contract time extensions will not be granted due to rejection of any proposed alternatives by the Engineer.

If a proposed alternative is rejected by the Engineer, other alternatives may be presented to the Department for consideration but are subject to the requirements of this special provision. Each subsequent request for approval of a proposed alternative will require an additional 30 days for the Department to review the request, at no additional cost to the contract, and with no contract time extensions.

If all proposed alternatives are rejected by the Engineer, provide limited deflection TCB meeting the requirements of Standard Plan R-53 Series.

c. Materials. Provide materials in accordance with the requirements of this special provision. Provide written certification to the Engineer, prior to limited deflection TCB installation, certifying that the materials used to construct and install limited deflection TCB meet all of the requirements of this special provision. Provide all required documents, as specified in this special provision, to the Engineer prior to limited deflection TCB installation.

Ensure materials for alternatives to Standard Plan R-53 Series are approved by the Engineer.

Ensure welding for all steel components complies with AWS D1.5, *Bridge Welding Code*.

1. Condition of TCB Sections. Provide TCB sections meeting the requirements in the *ATSSA Quality Guidelines for Work Zone Traffic Control Devices*.

TCB sections that, as determined by the Engineer, do not meet the requirements in the *ATSSA Quality Guidelines for Work Zone Traffic Control Devices* will be rejected and must be replaced by the Contractor at no additional cost to the contract.

2. Concrete. Use Grade 4500 concrete meeting the requirements specified in section 1004 of the Standard Specifications for Construction, with the following exception:

A. Ensure the minimum 28-day compressive strength must be 5,000 pounds per square inch (psi).

Alternative concrete types will be permitted when all of the following requirements are satisfied:

B. Ensure the minimum 28-day compressive strength must be 5,000 psi, and;

C. The concrete type is equivalent to or exceeds the requirements of that used in similar TCB sections that were successfully crash tested in accordance with the requirements of *NCHRP 350,* TL-3 or the *MASH,* TL-3.

Provide the Engineer written certification that the concrete used to construct limited deflection TCB sections meets the requirements of this special provision, including the concrete mix design, compressive strength testing data and, if applicable, supporting documentation regarding alternative concrete types.

3. Steel Reinforcement and Loop Bars. Use steel reinforcement meeting the requirements specified in section 905 of the Standard Specifications for Construction.

Ensure loop bars (D1, D2, D3, and D4, respectively, as specified in Standard Plan R-53 Series) meet the following requirements:

A. Constructed of smooth steel bars;

B. Minimum yield strength of 60,000 psi;

C. Minimum tensile strength of 80,000 psi, and;

D. Capable of being bent 180 degrees using a 2.75 inch inside bend diameter without damaging the bar.

Install loop bars in TCB sections with a tolerance of ±1/8 inch of plan dimensions.

4. TCB Fabrication and Curing. Cast barriers in accordance with the weather and temperature limitations specified in subsection 602.3.T of the Standard Specifications for Construction.

Ensure a uniform, smooth finish on TCB surfaces.

Cure concrete in accordance with subsection 804.03.F of the Standard Specifications for Construction.

5. Box-Beam Elements and Related Hardware. Ensure box-beam elements meet the requirements of Standard Plan R-53 Series, be cold-formed welded and seamless structural steel tubing meeting *ASTM A500/A500M, Grade C*. Box-beam elements must not have any splices and must not have any welds made after fabrication. Ensure box-beam elements are hot-dip zinc coated in accordance with *ASTM A123/A123M* after fabrication.

If requested by the Engineer, the Department will test box-beam elements as specified in subsection 908.09.B of the Standard Specifications for Construction.

The box-beam element manufacturer must place identification on each box-beam element as specified in subsection 908.09.B of the Standard Specifications for Construction.

Ensure threaded rods for securing box-beam elements to TCB sections meet the requirements of *ASTM F1554 Grade 36*. Ensure hex nuts meet the requirements of *ASTM A563, Grade A*. Ensure washers meet the requirements of *ASTM F436/F436M*. Ensure square plates are made of steel meeting *ASTM A36/A36M*. Ensure threaded rods, nuts, and washers are hot-dip zinc coated in accordance with *ASTM A153/A153M*. Ensure square plates are hot-dip zinc coated in accordance with *ASTM A123/A123M*.

6. Connection Pins, Stakes, Anchors Bolts, and Related Hardware. Provide connection pins and stakes fabricated with *ASTM A36/A36M* steel. Ensure connection pins and stakes are free of corrosion, as determined by the Engineer, prior to installation.

Provide square washers made of *ASTM A36/A36M* steel and hot-dip zinc coated after fabrication in accordance with *ASTM A153/A153M*.

Provide zinc-coated anchor bolts and threaded rods meeting the requirements of *ASTM F1554, Grade 36*, with rolled threads in compliance with the thread series requirements of *ANSI B1.1* Coarse Thread Series, and a tolerance class that accommodates the corrosion protective coating.

Provide zinc-coated Heavy Hexagonal series and Heavy Hexagonal Jam series nuts meeting the requirements of *ASTM A563* and intended for use with anchor bolts and/or threaded rods, as identified in Standard Plan R-53 Series for anchoring TCB sections to the underlying surface. Ensure nuts are also compatible with the strength requirements for the Grade of anchor bolt and/or threaded rod specified in accordance with the guidelines of *ASTM A563* for the Property Class and design style of the nut. Ensure all nuts comply with their respective Property Class requirements of *ASTM A563*.

Provide zinc-coated, steel lock washers that meet the requirements of *ANSI B18.21.1* for regular, helical spring lock washers.

Zinc coat anchor bolts, threaded rods, nuts, and lock washers in accordance with *ASTM A153/A153M.*

Provide steel tubes for reinforcing anchors in bridge decks made from Drawn Over Mandrel (DOM) steel tubing meeting the requirements of *ASTM A513/A153M, Type 5*, and having a minimum yield strength of 72,000 psi.

7. Miscellaneous Items. Provide an adhesive anchoring system from the Qualified Products List (712.03J) for securing anchor bolts and/or threaded rods to the underlying surface when using the Drilled and Grouted Method, Details 4A and/or 4B, from Standard Plan R-53 Series.

Provide Type H-1 (non-metallic) non-shrinking grout from the Qualified Products List (702.02B) or prepackaged hydraulic fast set mortar (without an extender) from the Qualified Products List (703), for repairing holes and other damages to all underlying surfaces (concrete, hot mix asphalt (HMA), or composite) as a result of pinning TCB to the underlying surface.

Provide reflectors, for attaching to TCB sections, meeting the requirements of subsection 922.04.A of the Standard Specifications for Construction.

Ensure bonding material used for adhering reflectors to TCB sections is approved by the Engineer before installing reflectors.

Select zinc-rich paint for repair of damaged galvanized surfaces from the Qualified Products List (915). Use a zinc-rich paint closely matching the color of the surface to be repaired.

8. Transition sections for interconnecting standard temporary barrier and limited deflection TCB with dissimilar cross-sections, materials, and/or connections. Interconnect TCB sections with dissimilar cross-sections and/or connections by using a transitional TCB section meeting the following requirements:

A. Ensure the transitional TCB section length is equal to or greater than the length of adjoining TCB sections. Ensure when adjoining TCB sections having dissimilar lengths, the transitional TCB section length is equal to or greater than the length of the longest adjoining TCB section.

B. The transitional TCB section must have the same cross-sectional dimensions and connection type of one TCB on one end, and the same cross-sectional dimensions and

connection type of the other TCB type on the other end.

C. The cross-section of the transitional TCB section must change gradually throughout the length of the section and must have a relatively smooth surface with no protruding corners or edges.

D. The transitional TCB section must contain reinforcing steel similar in layout and composition to the adjoining TCB sections.

E. Ensure concrete used to construct the transitional TCB section is similar to the concrete in adjoining TCB sections. If adjoining TCB sections are constructed with dissimilar concrete types, use the concrete type with the largest 28-day compressive strength to construct the transitional TCB section.

Interconnecting TCB and temporary steel barrier (TSB) sections on a specific run of temporary barrier will only be permitted if the Contractor provides documentation to the Engineer confirming that the connection between the TSB and TCB meets the crashworthy criteria of *NCHRP 350*, TL-3 or *MASH*, TL-3. In addition, any connection between TSB and TCB must meet manufacturer's specifications.

d. Construction. Furnish, install, operate, inspect, maintain, clean, and remove barrier sections in accordance with Standard Plan R-53 Series, Standard Plan R-126 Series, as specified on the plans, as specified in this special provision, and as specified by the Engineer.

Ensure construction and placement methods for alternatives to Standard Plan R-53 Series are approved by the Engineer prior to installation.

Place barrier sections before diverting traffic. Provide clean barriers meeting the requirements of this special provision. When placing barrier sections on pavement, clean the pavement of any material that would reduce friction between the barrier section and the underlying pavement. During barrier installation, protect traffic by using or installing standard warning and channelizing devices. After placing end treatment, place barriers in the direction of the flow of traffic. Remove barriers in the direction opposite to traffic flow.

Place barrier sections with an offset, measured from the nearest edge of the TCB to the drop-off or the edge of slab, as specified on the plans or by Engineer.

Prior to linking barrier sections together, place a 3⅝ inch wide wood block between adjacent TCB sections and push the adjacent TCB sections toward each other until both TCB sections come in contact with the wood block. The resulting gap between TCB sections must be 3⅝ inches with an acceptable tolerance of ±1/8 inch. Interconnect TCB sections with connection pins and other required hardware. Maintain the barrier with end-attachments engaged.

Ensure the gap between Type J1 and Type J2 TCB sections does not exceed 4 inches after barrier sections are fully engaged with cable assemblies and connection pins installed.

Field cutting threaded rods to length will be permitted so long as threads along the entire length of the rod are not damaged, and rods are not damaged, bent, or deformed during the cutting process. Ensure nuts attached to threaded rods are capable of being completely removed and reinstalled after rods are cut to length.

Inspect all installations periodically, as specified by the Engineer, to ensure all non-galvanized steel components remain free of corrosion while in service. Replace all non-galvanized steel components that appear to be damaged or corroded.

Repair all galvanized components where the galvanized surface has been damaged or where underlying steel has been exposed. Clean the damaged surface to near-white metal before applying zinc-rich paint. Do not damage barrier sections or connections as part of the cleaning process. Apply zinc-rich paint to exposed steel in accordance with the manufacturer's recommendations for temperature and dryness.

1. Box Beam Stiffened Method - Detail 1. Field drilling holes in box-beam elements will be permitted so long as the holes meet the requirements of Standard Plan R-53 Series, and zinc-rich paint is applied to exposed steel in accordance with the requirements of this special provision. Drilling additional holes and holes with different diameters in box-beam elements is prohibited. Do not damage any identification on box-beam elements while field drilling holes.

Field welding and splicing box-beam elements is prohibited.

Install box-beam elements in accordance with Standard Plan R-53 Series. Do not drill new holes in TCB sections adjacent to or near existing holes, unless otherwise specified by the Engineer. Do not damage steel reinforcement or steel connections while drilling holes in TCB sections.

If box-beam elements cannot be installed on existing TCB sections in accordance with this special provision, replace existing TCB sections with new TCB sections at no additional cost to the contract.

Shim resulting gaps between TCB sections and box-beam elements in accordance with Standard Plan R-53 Series. Tighten all nuts securing box-beam elements to TCB sections without cracking, damaging, or deforming TCB sections, box-beam elements and hardware.

Unless otherwise specified by the Engineer, anchor the beginning and ending limited deflection TCB sections to the underlying surface using the Drilled and Grouted Methods (Details 4A and 4B, respectively, from Standard Plan R-53 Series) when the TCB section is placed on concrete or composite (concrete and HMA) pavements, respectively, or the Staked Method (Detail 2, Standard Plan R-53 Series) when the TCB section is placed on HMA pavement. Obtain the Engineer's approval before anchoring TCB sections to bridge decks when using the Box Beam Stiffened Method (Detail 1, Standard Plan R-53 Series).

2. Staked Method - Detail 2. Drill 1.5 inch diameter holes through the entire thickness of the pavement before installing stakes.

Verify the location of underground utilities/obstructions prior to TCB placement. Follow the requirements of Standard Plans R-53 Series when stake omission is necessary to avoid impacting underground utilities/obstructions.

3. Through-Bolt Method in Concrete Bridge Deck - Detail 3A and Through-Bolt Method in Composite (concrete and HMA) Bridge Deck - Detail 3B.

Core drill anchor holes in bridge deck in accordance with Standard Plan R-53 Series.

Determine the location of steel reinforcement in the bridge deck with a pachometer, or other nondestructive method, to avoid cutting or damaging reinforcement while coring anchor holes. If possible, adjust placement of TCB sections longitudinally before coring anchor holes to avoid cutting or damaging steel reinforcement. Notify the Engineer immediately if the location of steel reinforcement in the bridge deck conflicts with proposed anchor hole locations. Obtain approval from the Engineer prior to drilling holes that may cut or damage steel reinforcement in the bridge deck.

Avoid spalling concrete during drilling. If spalling occurs, remove loose concrete before installing anchor bolts. Remove concrete fragments from the work area. Do not patch spalled areas.

Install steel tubes in anchor holes in accordance with Standard Plan R-53 Series when using the Through-Bolt Method in Composite (Concrete and HMA) Bridge Deck - Detail 3B.

Install anchor bolts or threaded rods in accordance with Standard Plan R-53 Series. Ensure nuts and bolts/threaded rod are fully engaged with at least one bolt/rod thread extending beyond nuts. Tighten nuts without cracking or damaging concrete near anchor bolt blockouts in TCB sections. Replace TCB sections with cracked or damaged concrete near anchor bolt blockouts at no additional cost to the contract.

4. Drilled and Grouted Methods - Details 4A and 4B. Install grouted anchors in accordance with Standard Plan R-53 Series and subsection 712.03.J of the Standard Specifications for Construction, with the exception that the field testing requirements of subsection 712.03.J.2 of the Standard Specifications for Construction will not be required.

Do not tighten nuts until adhesive has fully cured in accordance with the manufacturer's recommendations. Tighten nuts without cracking or damaging concrete near anchor bolt blockouts in TCB sections. Replace TCB sections with cracked or damaged concrete near anchor bolt blockouts at no additional cost to the contract.

Install Type B high intensity lights on barrier sections in accordance with Standard Plan R-126 Series.

Attach reflectors to barrier sections to delineate the barrier. Remove dirt and other material that could diminish adhesion from the barrier before installing reflectors. Attach reflectors in accordance with the manufacturer's recommended adhesive and installation procedures. Install reflectors near the center of the barrier, and at a height of 18 inches ±1 inch above the bottom of the barrier section to the top of the reflector. Ensure reflectors are installed on all barrier sides exposed to traffic. Provide a maximum longitudinal reflector spacing of 20 feet. Ensure the color of the reflector matches the color of the edgeline pavement marking in that location.

Remove and replace damaged reflectors. Position replacement reflectors directly in front of the damaged reflector.

Completely remove all pins and/or connecting hardware from the underlying pavement after removing the barrier. Remove grouted anchors by core drilling the anchor with a core barrel twice the diameter of the anchor to a depth equal to the installed depth and removing the resulting core.

Remove dust and debris from the resulting holes in the underlying pavement/bridge deck. Repair any holes, spalls, or damages to the underlying pavement/bridge deck to the Engineer's

satisfaction.

Replace barrier sections structurally damaged during handling or by traffic. If directed by the Engineer, repair non-structural damage to TCB sections affecting the performance of the TCB.

e. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

Pay Item	**Pay Unit**
Conc Barrier, Temp, Limited Deflection, Det __, Furn	Foot
Conc Barrier, Temp, Limited Deflection, Det __, Oper	Foot
Conc Barrier, Temp, Limited Deflection, Reflector Replacement	Each

1. **Conc Barrier, Temp, Limited Deflection, Det __, Furn** includes furnishing and installing limited deflection TCB meeting Standard Plan R-53 Series, of specified detail, or approved alternatives to Standard Plan R-53 Series. Additional payment will not be provided for furnishing multiple temporary barrier types for each detail. **Conc Barrier, Temp, Limited Deflection, Det __, Furn** will be measured as the maximum number of units required by the Engineer on one project, at one time during the life of the contract. Furnishing and installing reflectors on temporary barrier sections during initial temporary barrier installation is included in this pay item. Furnishing and installing transitional temporary barrier sections, as needed, is included in this pay item. Removing and replacing damaged reflectors after initial temporary barrier installation will be paid for separately.

Additional payment will not be provided for pinning TCB sections to the underlying surface as required when Detail 1 is specified.

Furnishing and installing J1/J2 TCB assemblies and associated hardware, when specified on the plans or by the Engineer, will be paid for separately.

2. **Conc Barrier, Temp, Limited Deflection, Det __, Oper** includes operating, cleaning, maintaining, and removing limited deflection TCB meeting Standard Plan R-53 Series, of specified detail, or approved alternatives to Standard Plan R-53 Series. Payment for repairing damaged galvanized surfaces where the underlying steel has been exposed is included in this pay item. Payment for repairing pavements/bridge decks as a result of anchoring temporary barrier sections to the underlying surface is included in this pay item. **Conc Barrier, Temp, Limited Deflection, Det __, Oper** will be measured as the maximum number of units required by the Engineer on one project, at one time during the life of the contract. Payment for cleaning reflectors throughout the life of the contract is included in this pay item.

Operating, cleaning, maintaining, and removing J1/J2 TCB assemblies and associated hardware will be included in this pay item.

3. **Conc Barrier, Temp, Limited Deflection, Reflector Replacement** includes removing a damaged marker from limited deflection temporary barrier, meeting Standard Plan R-53 Series or any alternatives approved by the Engineer, and any associated transition sections after initial placement, and furnishing and installing a new barrier reflector.

4. Damage Compensation. Notify the Engineer of damaged barrier sections. Before replacement and disposal, allow the Engineer to verify the condition of damaged barrier

sections eligible for payment. The Department will pay the furnished unit price for replacing limited deflection temporary barrier sections damaged by vehicular traffic, other than the Contractor's vehicles and equipment, to the extent that barrier section replacement is required or when repair costs exceed the furnished unit price of the damaged barrier sections.

The Department will pay for repairing limited deflection temporary barrier sections damaged by vehicular traffic, other than the Contractor's vehicles and equipment, when all of the following requirements have been met:

A. The Engineer approves the repair of damaged barrier sections;

B. The Contractor submits a written invoice to the Engineer detailing the material, labor, and equipment costs required to repair the damaged barrier sections; and

C. The repair costs, as approved by the Engineer, do not exceed the furnished unit price of the barrier sections requiring repairs.

The Department will not pay for repairing or replacing damaged barrier sections and associated hardware caused by the Contractor's vehicles, equipment, operations, or negligence, as determined by the Engineer.

If the Contractor uses alternative construction methods or operations that require additional limited deflection temporary barrier quantities (furnished and operated) that exceed the quantities specified in the contract, the additional quantities will be provided at the Contractor's expense.

Furnishing and installing temporary attenuators, as needed, for shielding temporary barrier endings will be measured and paid for separately.

All costs associated with installing/removing pins and/or connecting hardware from the underlying pavement/bridge deck and repairing damages to the underlying pavement/bridge deck will be included in the pay items described in this special provision, and will not be paid for separately. This includes all costs associated with securing temporary barrier sections to the underlying pavement/bridge deck, as detailed in Standard Plan R-53 Series, or by other methods approved by the Engineer.

CITY OF ANN ARBOR
SPECIAL PROVISION
FOR
SOIL NAILS FOR SLOPE STABILIZATION

DLZ/DML:COAA/FC 1 of 16 09/20/2022

a. Description. This work consists of constructing a permanent soil nail retaining wall for slope stabilization as specified herein and at the location shown on the Plans. The Contractor shall furnish all labor, materials and equipment required for completing the work. The Contractor shall select the method of excavation, drilling method and equipment, drilled hole diameter(s), final soil nail length(s), and grouting procedures to meet the performance requirement specified herein. The required soil nail locations, orientations, and minimum lengths and the design loads are to be designed by the Soil Nail Engineer. The term “Soil Nail” as used in these specifications is intended as a generic term and refers to a reinforcing bar grouted into a drilled hole installed in any type of ground. Soil nail walls are built from the top down in existing ground.

Soil nails are typically solid bars. Hollow Bar Soil Nails (HBSN) shall not be used unless specifically allowed in the Plans. When HBSN are used, the subsections herein referring to HBSN shall supersede the preceding section where they differ. Otherwise, the requirements for HBSN are the same as for solid bar soil nails.

Soil nailing work shall include excavating as necessary for the work; drilling soil nail drilled holes; furnishing, placing, and grouting the encapsulated or epoxy coated nail bar tendons into the drilled holes; placing drainage elements; placing shotcrete reinforcement; applying shotcrete facing over the reinforcement; attaching bearing plates and nuts; performing nail testing; casting the final cast-in-place concrete facing, and backfilling as necessary to the finish grades shown on the plans to accommodate surface treatment, such as concrete slope paving, by the bridge contractor.

Examine the plans and visit the site prior to bidding the work to assess the site geometry, equipment access conditions, subsurface conditions, location of existing structure(s), overhead restrictions, and any other factors which may influence the bid.

1. Contractor Qualifications. Contractors will need to submit their qualifications to the Engineer for review at the preconstruction meeting. Submit qualifications satisfying the requirements below. No soil nail construction can begin until the Engineer has approved the Contractor’s qualifications.

A. Documented experience verifying the successful construction completion of at least 5 soil nail retaining wall projects during the past 3 years totaling at least 1200 square feet of wall face area and the installation of at least 500 soil nails. At least 3 of these soil nailing projects shall include installing soil nail walls under the foundation of existing structures. Include a brief description of each project with the Owner's name and current phone number.

B. Documented experience in soil nail drilling and grouting in subsurface conditions with boulders and cobbles similar to the project site.

C. Documented experience of the Contractor’s personnel who will be performing and supervising the soil nailing work. The Contractor shall not use consultants or manufacturer's representatives to satisfy the requirements of this section, with exception to the Design Engineer. The report shall include the names of a Soil Nail Engineer, Soil Nail Site Supervisor, Drill Operators, and Design Engineer. The report shall also contain a list of employer's names and telephone numbers, location and dates of previous permanent soil nailing or tieback projects, and the extent of work performed. This information must be verifiable. The personnel performing soil nailing work shall have acquired work experience, which is not less than the level of experience as defined below.

The Engineer will accept or reject the Contractor's personnel within thirty (30) calendar days following the submission of the report of names and verifiable resume information. Soil nailing work shall not commence until the Engineer has provided a written letter of acceptance. In the event the Contractor elects to substitute personnel, submit verifiable resume information to the Engineer prior to that individual's performance of soil nailing work. The Engineer will accept or reject the Contractor's proposed substitute within fifteen (15) calendar days. The Engineer may suspend the work if the contractor uses unacceptable personnel. If work is suspended for use of unacceptable personnel, no adjustment in contract costs or contract time attributed to the suspension will be made.

2. Soil Nail Engineer. The Soil Nail Engineer shall be a Michigan Registered Professional Engineer and is responsible for overseeing the soil nailing work and verifying the results of the testing. The Soil Nail Engineer shall have three (3) years of construction experience in the installation of permanent soil nails or tiebacks and shall have overseen the successful installation of over 100 permanent soil nails or tiebacks. The work experience time period is computed by the addition of all documented durations of soil nailing or tieback work time on construction projects.

3. Soil Nail Site Supervisor. The Soil Nail Site Supervisor shall be present at the job site at all times during the performance of soil nailing work. The Soil Nail Site Supervisor shall have one (1) year of construction experience in the installation of permanent soil nails or tiebacks and shall have supervised the successful installation of over 100 permanent soil nails or tiebacks. The work experience time period is computed by the addition of all documented durations of soil nailing or tieback work time on construction projects.

4. Drill Operators. Drill operators shall have successfully installed at least 50 permanent soil nails or tiebacks.

5. Design Engineer. The Design Engineer shall be a Michigan Registered Professional Engineer and is responsible for designing the soil nailing work and verifying the results of the testing. The Design Engineer shall have five (5) years of experience in the design of permanent soil nails or tiebacks and shall have designed the successful installation of at least 10 permanent soil nail walls or tieback walls. The work experience time period is computed by the addition of all documented durations of soil nailing or tieback work time on construction projects.

b. Submittals

1. Personnel. At least 45 calendar days before starting soil nail work, submit names of the Soil Nail Engineer, Soil Nail Site Supervisors, and Drill Operators assigned to the project, and a summary of each individual's experience. Only those individuals designated as meeting the experience requirements shall be used for the project. The Contractor cannot substitute for any of these individuals without written approval of the Owner or the Owner's Engineer. The Owner's Engineer shall approve or reject the Contractor qualifications and staff within 7 calendar days of receipt of the submission. Work shall not be started nor materials ordered until the Contractor's qualifications have been approved by the Owner's Engineer. The Owner's Engineer may suspend the work if the Contractor substitutes unapproved personnel for approved personnel during construction. If work is suspended due to the substitution of unqualified personnel, the Contractor shall be fully liable for all additional costs resulting from the suspension of work, and no adjustment in contract time resulting from the suspension of the work shall be allowed. The Contractor shall have overall contractual responsibility for both the design and construction.

2. Design Submittals

A. General

(1) The Contractor shall *submit the following items with their bid:* global stability analysis results, estimated wall deformation and corrosion resistance category for their design to demonstrate that it meets the intent of the Contract Drawings and these Special Provisions.

(2) At least 30 calendar days before the planned start of the wall construction, the Contractor shall submit complete Design Calculations and Design Drawings to the Engineer for review and approval. Include all details, dimensions, quantities, ground profiles, and cross-sections necessary to conduct the work.

(3) Design Drawings and calculations shall be signed and sealed by the Contractor's Design Engineer, previously approved by the Owner's Engineer.

(4) Submit sets of the Design Drawings with the initial submission. The Design Drawings shall be submitted to the City of Ann Arbor. The Owner's Engineer will approve or reject the Contractor's submittal within 15 calendar days of the receipt of the complete submission.

(5) The Owner's Engineer will approve or reject the Contractor's submittals within 14 calendar days of the receipt of the complete submission.

(6) One set will be returned with any indicated corrections. If revisions are necessary, make the necessary changes and resubmit revised sets. When the drawings are approved, furnish sets of the approved drawings.

(7) The Contractor shall not begin the work until the submittal requirements are satisfied and found acceptable by the Engineer.

(8) Changes or deviations from the approved submittals must be re-submitted for approval. No adjustments in contract time or delay, or impact claims will be allowed due to incomplete submittals.

B. Design Calculations. Design calculations shall include, but not be limited to, the following items.

(1) A narrative describing the overall soil nail wall design.

(2) Applicable code requirements and references.

(3) Design criteria, including soil/rock shear strength parameters (friction angle and cohesion), unit weights, pullout resistances, steel resistances, and shotcrete resistance values. Any additional subsurface borings, laboratory work, or other subsurface data collected for the design shall also be included.

(4) Soil nail critical cross-section(s) including soil/rock strata, piezometric levels, and location, magnitude, and direction of applied loads.

(5) Values and associated load factors used in design for pullout resistance, surcharges, soil/rock unit weights, nail head strengths, and strengths of steel, shotcrete, and concrete materials. Global stability soil resistance/load factors used in LRFD verifications.

(6) Seismic design coefficient and other seismic design criteria applicable for the geographic area of the project.

(7) Design calculation sheets with the project number, structure location, designation, date of preparation, initials of designer and checker, and page number at the top of each page. Provide an index page with the design calculations.

(8) Design notes including an explanation of symbols and computer programs used in the design.

(9) Structural design calculations for wall facing(s) and nail head/facing connections including consideration of facing flexural and punching shear strength, headed stud tensile strength, upper cantilever, minimum reinforcement ratio, cover, and splice requirements.

(10) Other design calculations not considered above.

C. Design Drawings. Design Drawings shall include all information required for the construction and quality control of the work. Design Drawings shall include, but not be limited to, the following items unless provided in the Contract Drawings:

(1) A plan view of the structure(s) identifying:

(a) A reference baseline and elevation datum.

(b) The offset from the construction centerline or baseline to the face of the wall at its base at all changes in horizontal alignment.

(c) Beginning and end station of wall.

(d) Soil nail locations.

(e) Right-of-way and permanent or temporary construction easement limits, location of all known active and abandoned existing utilities, adjacent structures or other potential interferences. The centerline of any drainage structure or drainage pipe behind, passing through, or passing under the wall.

(f) Subsurface exploration locations shown on a plan view of the proposed wall alignment with appropriate reference base lines to fix the locations of the explorations relative to the structure(s).

(g) Limit of longest nails.

(h) Existing and proposed pile locations.

(i) Existing utility locations.

(2) An elevation view of the structure(s) identifying:

(a) The elevation at the top of the wall, at all horizontal and vertical break points, and at least every 50 ft along the wall.

(b) Elevations at the base of the wall and the top of leveling pads for casting CIP facing (if applicable).

(c) Soil-nail elevations, vertical and horizontal spacing, and the location of wall drainage elements and permanent facing expansion/contraction joints (if applicable) along the wall length.

(d) Existing and finished grade profiles both behind and in front of the wall.

(e) Existing and proposed pile locations.

(f) Existing utility locations.

(3) All necessary cross-section(s) to construct the wall.

(4) General notes for constructing the soil nails including construction sequencing or other special construction requirements.

(5) Design parameters and applicable codes.

(6) Horizontal and vertical curve data affecting the wall and control points, including match lines or other details to relate to wall stationing to centerline stationing.

(7) A listing of the summary of quantities on the elevation drawing of each wall showing the estimated surface area expressed in square feet and other pay items.

(8) Nail wall typical sections including staged excavation lift elevations, wall and excavation face batter, nail spacing and inclination, sizes of nail bars (also referred to as tendons), and corrosion protection details.

(9) Typical details of production and test nails defining the nail length, minimum drill hole diameter, inclination, and test nail bonded and unbonded test lengths.

(10) Details, dimensions, and schedules for all nails, reinforcing steel, wire mesh, bearing plates, headed studs, etc. and/or attachment devices for shotcrete, cast-in-place or prefabricated facings.

(11) Dimensions and schedules of all reinforcing steel including reinforcing bar bending details.

(12) Details and dimensions for wall appurtenances such as barriers, coping, drainage gutters, fences, etc.

(13) Details for constructing walls around drainage facilities.

(14) Details for terminating walls and adjacent slope construction.

(15) Any backfill materials and details.

3. Construction Submittals

A. Construction Plan. At least 30 calendar days before starting the soil nail work, the Contractor shall submit a Construction Plan to the Owner's Engineer that includes the following:

(1) Project start date and proposed detailed soil nail construction sequence.

(2) Drilling and grouting methods and equipment, including the drill hole diameter proposed to achieve the specified nominal pullout resistance values and any variation of these along the wall alignment.

(3) Nail grout mix design, including compressive strength test results (per AASHTO T106/ASTM C109) supplied by a qualified independent testing lab verifying the specified minimum 3-day and 28-day grout compressive strengths. For neat cement grout include specific gravity test results of the fresh grout used for compressive testing.

(4) Nail grout placement procedures and equipment.

(5) Temporary shotcrete materials and methods. Provide the minimum 3-day and 28-day shotcrete compressive strengths.

(6) Soil nail testing methods and equipment setup.

(7) Identification number and certified calibration records for each test jack, pressure gauge, dial gauge, and load cell to be used. Jack and pressure gauge shall be calibrated as a unit. Calibration records shall include the date tested, the device identification number, and the calibration test results, and shall be certified for an accuracy of at least 2 percent of the applied certification loads by a qualified independent testing laboratory within 90 calendar days prior to submittal.

(8) Manufacturer's Certificates of Compliance for materials including: ultimate strength of the tendon, Portland cement, centralizers, bearing plates, epoxy coating, and encapsulation.

(9) The Owner's Engineer shall approve or reject the Contractor's Construction Plan within 15 calendar days of receipt of the submission. Approval of the Construction Plan does not relieve the Contractor of his responsibility for the successful completion of the work.

B. Monitoring Plan. At least 30 calendar days before starting the soil nail work, the Contractor shall submit a Monitoring Plan, if applicable for the project, to the Owner's Engineer for approval. The Owner's Engineer shall approve or reject the Contractor's Monitoring Plan within 14 calendar days of receipt of the submission.

4. Pre-Construction Meeting. A pre-construction meeting may be scheduled by the Engineer and held prior to the start of wall construction. The Engineer, prime Contractor, and soil nail specialty Contractor shall attend the meeting. The excavation Contractor, structure foundation installation Contractor, shotcreting Contractor, and survey Contractor, if different than the prime or soil nail specialty contractor, shall also attend. The pre-construction meeting will be conducted to clarify the construction requirements for the work, to coordinate the construction schedule and activities, and to identify contractual relationships and delineation of responsibilities amongst the prime Contractor and the various Subcontractors – particularly those pertaining to wall excavation, nail installation and testing, excavation and wall alignment survey control, and shotcrete and CIP facing construction. Soil nail wall construction requires excavation in staged lifts and excavation in the vicinity of the wall face requires special care and effort compared to general earthwork excavation.

c. Definitions. The following definitions apply to this work:

Alignment Load. The load maintained on a soil nail during testing to assure that the testing equipment remains in proper position, not to exceed 2.5 percent of the maximum test load (VTL or PTL).

Anchorage. The bearing plate, nut, and beveled washer that secure the concrete facing to the soil nail.

Bonded Test Length. The length of the test nail tendon that is bonded to the ground with grout and develops adhesion during testing.

Creep Curve. A semi logarithmic plot of the creep movement versus time, with the units of time plotted on the logarithmic axis.

Creep Movement. The time-dependent movements of the soil nail tendon at a constant load.

Creep Rate. The slope of the creep curve per log cycle of time over the final decade of the observation period.

Design Load. The maximum load anticipated to be applied to the soil nail during its service life. For soil nail walls designed under LRFD, this is expressed as the Factored Design Load (FDL).

Hollow Bar Soil Nail (HBSN). Hollow, steel threaded tendons that are drilled and grouted in a single operation. Grout is injected through the tendon as the drilling proceeds. The grout exits through ports that are located in a sacrificial drill bit, flushes soil cuttings out of the drill hole, and fills the annular space between the tendon and the drill hole.

Soil Nail Grout. Cement grout that is injected into the drilled hole by tremie methods to cover the full length of the soil nail and provide bonding of the soil nail to the surrounding ground.

Maximum Permissible Load. The maximum permissible load is the maximum load that may be applied to the soil nail during any stage of the work. The maximum permissible load is 90 percent of the yield strength for AASHTO M31/ASTM A615 Grade 60 through Grade 100 bars, or 80 percent of the ultimate strength for ASTM A722 Grade 150 bars.

Maximum Test Load. The largest load applied to the soil nail when stressing during a load test. This is defined as the Verification Test Load (VTL) for pre-production Verification Tests of sacrificial test nails, and this is defined as the Proof Test Load (PTL) for Proof Tests of production nails.

Proof Test. A soil nail load test that requires the application of defined incremental loads to the test soil nail up to the PTL and unloading of the test soil nail. The movement of the nail tendon is recorded at each load increment. At the PTL, the applied load is maintained constant for a defined time period while creep movement is recorded.

Unbonded Test Length. The length of the test nail tendon that is not bonded to the ground with grout and is free to elongate during testing.

Verification Test. This load test requires the application of defined incremental loads to the test soil nail up to the VTL and unloading of the test soil nail. The movement of the nail tendon is recorded at each loading and unloading increment. At 0.75 VTL, the applied load is maintained constant for a defined time period while creep movement is recorded.

d. Materials.

1. Soil Nail Tendon: AASHTO M31/ASTM A615 for Grade 60, 75, 80, or 100, or ASTM A722 for Grade 150. Deformed bar, continuous or spliced using approved bar couplers, new, straight, undamaged, bare or epoxy coated or encapsulated as shown on the Plans. Provide threading for a minimum of 6 inches on the wall anchorage end to allow proper attachment of bearing plate and nut. Threading may be continuous spiral deformed ribbing provided by the bar deformations (e.g. Dywidag or Williams continuous thread bars) or may

be cut into a reinforcing bar. If threads are cut into a reinforcing bar, provide the next larger bar number designation at no additional cost.

A. Hollow Bar Soil Nail (HBSN). Fully threaded, hollow steel tubing used as the drilling steel, grout transfer medium, and the reinforcing element of the soil nail. Tendons shall have a yield tensile strength between 60 ksi and 90 ksi. Tendons shall be new, straight, undamaged, bare, epoxy coated, galvanized, or encapsulated as shown on the Plans. The length of the threaded portion of the bar at the wall anchorage shall be as needed to allow proper attachment of the bearing plate and nut. Hollow bars shall meet the following requirements:

(1) The hollow bar shall be of a fine-grained structural steel.

(2) The ductility of the steel or the uniform elongation without necking shall be Agt ≥ 5%.

(3) The minimum Charpy impact resistance shall be 40 Joules at -20°C per ASTM E23.

B. HSBN Drill Bits. Drill bits shall be selected based on the subsurface information on site and the minimum grout column required in the design. Bits require a minimum of two ports to allow grout to exit the system. Additional ports (with smaller diameters) can be used to increase grout pressure and hole diameter.

2. Bar Couplers. Couplers shall develop the full ultimate tensile strength of the bar as certified by the manufacturer. Corrosion protection to the coupler shall be provided by means of a heat shrink sleeve or heavy duty cold applied coating tape.

3. HBSN Couplers. Couplers shall develop the nominal tensile capacity of the hollow bar as certified by the manufacturer and shall have a seal or a similar mechanism to ensure minimum grout loss through them. Couplers shall have a means of transferring the percussive forces when drilling, and tensile/compressive cyclic-loading forces when in service.

A. Centralizers. Centralizers shall be fabricated from Schedule 40 PVC pipe or tube, steel or other material not detrimental to the nail steel (wood shall not be used). They shall position the soil nails within 1 inch of the center of the drilled hole so as to provide a minimum required grout cover of 1 inch, allow tremie pipe insertion to the bottom of the drill hole, and allow grout to freely flow up the drill hole. Position centralizers along the soil nail so their maximum center-to-center spacing does not exceed 10 feet. Also locate centralizers within 1.5 feet from the top and bottom of the drill hole.

4. Grout. The cement for the grout shall be Type I, Type II, Type III, or Type V conforming to ASTM C150. The grout shall consist of a neat cement or sand/cement mixture with a minimum 3-day compressive strength of 1,500 psi and a minimum 28-day compressive strength of 3,000 psi per AASHTO T106/ASTM C109. Fine aggregate for the grout shall be per AASHTO M6/ASTM C33. The specific gravity of the grout shall range between 1.8 and 1.9.

A. HBSN Grout. The specific gravity of the grout used for drilling and installing the hollow bars may be lower than the final grout and range from 1.4 to 1.6. After the bar is installed to the desired depth, the final grout mixture shall be pumped through the hollow bar, and the nail is considered complete when the heavier mixture returns to the excavation face, signaling that the lighter drilling grout was flushed from the hole and that all drilling spoils have also been removed.

B. HBSN Grout Mixer and Pump. A high shear colloidal mixer with separate holding tank and water and cement dosing system should be used to ensure continuous grouting independent from mixing. Pumps should have flow rates of at least 15 gal/minute for the smaller diameter bars, and 45 gal/minute for the larger diameter bars (2 in. and above) shall be provided. A minimum of 250 psi pressure capability for sand and gravel and 1,500 psi capability should be available in clays and silts. To record the grout volume and pressure, an automated monitoring system may be used.

5. Admixtures. AASHTO M194/ASTM C494. Admixtures which control bleed, improve flowability, reduce water content and retard set may be used in the grout subject to review and acceptance by the Engineer. Accelerators are not permitted. Expansive admixtures may only be used in grout used for filling sealed encapsulations. Admixtures shall be compatible with the grout and mixed in accordance with the manufacturer's recommendations.

6. Encapsulation. Minimum 0.04-inch-thick corrugated HDPE tube conforming to AASHTO M252 or corrugated PVC tube conforming to ASTM D1784, Class 13464-B. Encapsulation shall provide at least 0.2 inches of grout cover over the nail bar. Factory fabrication of the encapsulation is preferred. Upon the Engineer's acceptance, the encapsulation may be field fabricated if done in strict accordance with the manufacturer's recommendations. The encapsulation shall be:

A. Resistant to chemical attack from aggressive environments, grout, or grease.

B. Fabricated from materials nondetrimental to the prestressing steel.

C. Capable of withstanding abrasion, impact, and bending during handling and installation.

D. Free of flaws which would permit water to enter into the soil nail system.

E. Capable of transferring stresses from the grout inside the capsule to the grout outside the capsule.

F. Resistant to ultraviolet light.

7. Film Protection. Polyethylene film per AASHTO M171.

8. Fusion Bonded Epoxy Coating. ASTM A775. Minimum 0.012 inch thickness electrostatically applied. Bend test requirements are waived. Coating at the wall anchorage end of epoxy-coated bars may be omitted over the length provided for threading the nut against the bearing plate.

9. Bearing Plate. The bearing plate shall conform to MDOT 2020 Standard Specifications for Construction Section 906.04 Structural Steel.

10. Anchorage. The steel nut and beveled washer used in the anchorage shall be the standard product of the bar manufacturer and conform to the requirements of MDOT 2020 Standard Specifications for Construction Section 906.07 High-Strength Steel Bolts, Nuts, and Washers for Structural Joints. The nut shall be hexagonal and fitted with beveled washer or spherical seat to provide uniform bearing. The anchorage shall be capable of transferring 100 percent of the guaranteed ultimate tensile strength (GUTS) from the soil nail tendon to the bearing plate.

11. Shear Connectors. Conform to MDOT 2020 Standard Specifications for Construction Section 906.09 Shear Developers.

12. Welded Wire Fabric. Conform to MDOT 2020 Standard Specifications for Construction Section 905.06 Steel-Welded Wire Reinforcement.

13. Reinforcing Steel. Conform to MDOT 2020 Standard Specifications for Construction Section 905 Steel Reinforcement.

14. Prefabricated Geocomposite Drain (PGD). Conform to MDOT 2020 Standard Specifications for Construction Section 910.05 Drainage Geocomposites.

15. Drain Pipe. Conform to MDOT 2020 Standard Specifications for Construction Section 909.07 Pipe for Underdrains.

16. Low Strength Mortar (Flowable Fill). Supply non-structural flowable fill consisting of a mixture of Portland cement, fly ash, sand (2NS) and water. Use materials in accordance with the standard specifications except as modified by this special provision. All non-structural flowable fill once cured is intended to be removable using conventional mechanical excavation methods.

Use either Type I or lA Portland cement in accordance with section 901 of the MDOT 2020 Standard Specifications for Construction and Class F or C fly ash as specified by ASTM C618 except that there is no limit on loss on ignition.

Produce a mix of cement, fly ash, sand, and water in the following proportions.

Portland Cement	50 pounds per cubic yard (lb/cyd)
Fly Ash	500 lb/cyd
Sand	2850 lb/cyd
Water	376 lb/cyd, approximately (sufficient to produce desired flowability)

17. Materials Handling and Storage. Store cement to prevent moisture degradation and partial hydration. Do not use cement that has become caked or lumpy. Store aggregates so that segregation and inclusion of foreign materials are prevented. Do not use the bottom 6 inches of aggregate piles in contact with the ground.

Store steel reinforcement on supports to keep the steel from contacting the ground. Damage to the nail steel as a result of abrasion, cuts, nicks, welds, and weld splatter shall be cause

for rejection. Do not ground welding leads to nail bars. Protect nail steel from dirt, rust, and other deleterious substances prior to installation. Heavy corrosion or pitting of nails shall be cause for rejection. Light rust that has not resulted in pitting is acceptable. Place protective wrap over the anchorage end of nail bars, to which bearing plates and nuts will be attached, to protect during handling, installation, grouting and shotcreting.

Do not move or transport encapsulated nails until the encapsulation grout has reached sufficient strength to resist damage during handling. Handle encapsulated nails in a manner that will prevent large deflections, distortions or damage. Repair encapsulated nails that are damaged or defective in accordance with the manufacturer's recommendations or remove them from the site.

Handle and store epoxy coated bars in a way that will prevent them from being damaged beyond what is permitted by ASTM 3963. Repair damaged epoxy coating in accordance with ASTM A775 and the coater's recommendations using an epoxy field repair kit approved by the epoxy manufacturer. Repaired areas shall have a minimum 0.012-inch coating thickness.

e. Construction Requirements

1. Storage. Tendons shall be stored and handled in a manner to avoid damage or corrosion. Tendons exhibiting abrasions, cuts, welds, weld splatter, corrosion, or pitting shall be replaced. Bars exhibiting damage to encapsulation or epoxy coating shall be repaired or replaced at no additional cost.

2. Excavation. The height of exposed unsupported final excavation face cut shall be established by the Contractor and shall not exceed the vertical nail spacing plus the required reinforcing lap or the short-term stand-up height of the ground, whichever is less.

Excavation to the final wall excavation line and shotcrete application shall be completed in the same work shift, unless otherwise approved by the Owner's Engineer.

Nail grout and shotcrete shall achieve sufficient strength before excavating the next underlying lift.

3. Soil Nail Installation. Drill holes for the soil nails shall be drilled at the locations, elevations, orientations, and lengths shown on the approved Design Drawings. The drilling equipment and methods shall be selected by Contractor to be suitable for the ground conditions and in accordance with the accepted installation methods submitted by the Contractor.

4. Protection of Adjacent Structures. Structures located within a horizontal distance equal to 30 feet shall be monitored for vertical and horizontal movement in a manner approved by the Engineer within an accuracy of 0.1 in. Monitoring of adjacent structures will be done by an independent party who must be approved by the Engineer and will work under the Contractor.

A monitoring plan, including the locations of measurement points and the frequency of recording measurements shall be submitted to the Engineer as part of the Construction Plan. Monitoring shall begin with a base-line measurement recorded no less than 10

calendar days prior to construction of the wall. In addition to monitoring for movement, the condition of the adjacent structure, including cracks and crack widths, before and after construction of the wall, shall be documented by visual inspection, photographs, and/or video. Structures owned by Owner shall be monitored for movement for a period of 180 days after completion of the work or as long as this requirement is called for on the Contract Drawings, whichever is longer.

As soon as the movements measured exceed action limit thresholds established for adjacent structures, not to exceed 0.15 inches and 0.25 inches for vertical and horizontal movement, respectively, the Contractor shall notify the Engineer.

As soon as the movements measured exceed maximum thresholds established for adjacent structures, not to exceed 0.3 inches and 0.5 inches for vertical and horizontal movement, respectively, the Contractor shall stop construction, notify the Engineer, and take any immediate remedial measures required to prevent damage to the adjacent structures. The Contractor and the Engineer shall then review the current installation procedures. If revisions to the installation procedures are deemed necessary, the Contractor shall submit a revised installation plan for approval by the Engineer before resuming work.

5. Soil Nail Testing

A. Tests. The Contractor shall perform both verification and proof testing of designated test soil nails. Verification tests on sacrificial test nails shall be conducted at locations shown on the approved Design Drawings. Proof tests on production nails shall be conducted at locations selected by the Owner's Engineer. Testing of any nail shall not be performed until the nail grout and shotcrete facing have cured for at least 72 hours or attained at least their specified 3-day compressive strength. The Contractor shall not apply loads greater than 80 percent of the minimum guaranteed ultimate tensile strength of the tendon for Grade 150 bars or 90 percent of the minimum guaranteed ultimate tensile strength of the tendon for Grade 60 or 75 bars. Preliminary results shall be submitted to the Owner and/or Owner's Engineer within 24 hours of the test completion. A full report containing test load results shall be submitted to the Owner and/or Owner's Engineer within 5 working days of the test completion.

Refer to FHWA Geotechnical Circular No. 7 "Soil Nail Walls," Chapter 9, for detailed guidance on soil nail testing.

B. Verification Testing. The Contractor shall perform a number of verification tests on sacrificial soil nails as established in the Design Drawings. Verification testing shall be conducted prior to installation of production soil nails on sacrificial soil nails to confirm the appropriateness of the Contractor's drilling and installation methods and verify the required nail pullout resistance.

The maximum test load in verification tests (VTL) shall be calculated based on as-built bonded lengths per FHWA Geotechnical Circular No. 7 "Soil Nail Walls," Chapter 9. The Load Schedule for Verification Testing shall comply with FHWA Geotechnical Circular No. 7 "Soil Nail Walls," Chapter 9.

C. Proof Testing. Successful proof testing shall be demonstrated on at least 5 percent of production soil nails in each nail row but no less than one per nail row. The

Owner's Engineer shall determine the locations and number of proof tests prior to nail installation in each row. For bidding purposes, the Contractor shall include a proof testing quantity equivalent to testing two production soil nails per row but no less than 5 percent of the total quantity of production soil nails. Verification tests shall not be counted towards the minimum of 5 percent production nails.

The maximum test load in proof tests (PTL) shall be calculated based on as-built bonded lengths per FHWA Geotechnical Circular No. 7 "Soil Nail Walls," Chapter 9. The Load Schedule for Proof Testing shall comply with FHWA Geotechnical Circular No. 7 "Soil Nail Walls," Chapter 9.

6. Acceptance Criteria

A. Verification Tests. Considering that pullout is defined as the load at which attempts to further increase the test load increments simply result in continued movement of the tested nail, a test nail shall be considered acceptable when all of the following criteria are met.

(1) The total creep movement is less than 0.08 in. between the 6- and 60-minute readings, and the creep rate is linear or decreasing throughout the creep test load hold period.

(2) The total movement (AVTL) measured at VTL exceeds 80 percent of the theoretical elastic elongation of the unbonded length of the test nail, as defined in FHWA Geotechnical Circular No. 7 "Soil Nail Walls," Chapter 9.

(3) Pullout does not occur before achieving 1.0 x VTL.

B. Proof Tests

(1) The creep movement between the 1- and the 10-minute readings is less than 0.04 in.

(2) In cases when the creep movement between the 1- and the 10-minute readings is greater than 0.04 in., the creep movement between the 6- and the 60-minute readings is less than 0.08 in., and the creep rate is linear or decreasing throughout the creep test load hold period.

(3) The total soil nail movement (APTL) measured at PTL exceeds 80 percent of the theoretical elastic elongation of the unbonded length, as defined in FHWA Geotechnical Circular No. 7 "Soil Nail Walls," Chapter 9.

(4) Pullout does not occur before the test load is 1.0 x PTL.

(5) The temporary unbonded test length in proof tests is successfully maintained for subsequent satisfactory grouting. If the unbonded test length of production proof test nails cannot be satisfactorily grouted after testing, the proof test nail shall become sacrificial and shall be replaced with an additional production nail installed at no additional cost to the Owner.

7. Rejection of Test Soil Nails

A. Verification Test Soil Nails. The Owner's Engineer will evaluate the results of each verification test. Installation methods that do not satisfy the nail testing requirements shall be rejected. The Contractor shall propose alternative methods for review by the Owner's Engineer and shall install replacement verification test nails. Replacement test nails shall be installed and tested at no additional cost.

8. Proof Test Soil Nails. For proof test nails, the Owner's Engineer may require the Contractor to replace some or all of the installed production nails between a failed proof test soil nail and the adjacent passing proof test nail. Alternatively, the Owner's Engineer may require the installation and testing of additional proof test nails to verify that adjacent previously installed production nails have sufficient nominal pullout resistance. Installation and testing of additional proof test nails or installation of additional or modified nails as a result of proof test nail failure(s) shall be at no additional cost.

9. Wall Drainage System (if applicable)

A. General. Provide all elements of a soil nail wall drainage system, if applicable, consisting of geocomposite drain strips, PVC connection pipes, soil nail wall footing drains, and weepholes, or similar, that will provide a continuous path for water flow and prevent pore water pressure from building up behind the wall.

B. Geocomposite Strip Drain. Provide geocomposite strip drain or similar to prevent pore water pressure from building up behind the wall and to convey the collected groundwater to the base of the wall behind the wall. Geocomposite strip drain shall have sufficient capacity to convey all drained groundwater, and sufficient resistance to prevent collapse during construction and operation.

C. Footing Drains. Footing drains shall collect groundwater from the drainage system and convey it to the existing ditch at the toe of the slope.

10. Shotcrete Facing

A. General. Initial shotcrete facing and final shotcrete facing shall be provided as required and as shown on the approved Design Drawings.

B. Shotcrete Facing Tolerances. Construction tolerances for the shotcrete facing from plan location and plan dimensions shall be as follows:

Table 1: Construction Tolerances for Shotcrete Facing

Item	Tolerance
Horizontal location of welded wire mesh, reinforcing bars, and headed studs	3/8 in.
Location of headed-studs on bearing plate	1/4 in.
Spacing between reinforcing bars	1 in.
Reinforcing lap	1 in.
Thickness of shotcrete, if troweled screeded	9/16 in.
Thickness of shotcrete, if left as shot	1-1/8 in.
Planeness of finish face surface, gap under 10-ft straightedge, if troweled or screeded	9/16 in.
Planeness of finish face surface, gap under 10-ft straightedge, if left as shot	1-1/8 in.
Nail head bearing plate deviation from parallel to wall face	10 degrees

11. Reinforcing Steel. The Contractor shall submit all order lists and reinforcement bending diagrams to the Owner's Engineer, and shall fabricate reinforcing steel, ship and protect material, place, fasten, and splice reinforcing steel as shown on the approved Design Drawings.

12. Structural Concrete. The Contractor shall design the concrete mix; store, handle, batch, and mix material; and deliver concrete; provide quality control; and construct concrete facing to meet the resistance requirements shown on the approved Design Drawings.

13. Corrosion Protection. Soil nails and soil nail head components shall be protected against corrosion consistent with the ground and groundwater conditions at the site with a minimum class A corrosion protection unless noted otherwise on the Contract Drawings.

f. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

Pay Item **Pay Unit**

Soil Nails for Slope Stabilization ..... Square Feet

1. **Soil Nails for Slope Stabilization** shall be measured by the square foot. Measurement will be made on the face of the finished slope of the stabilized area as accepted by the Engineer in the final work. **Soil Nails for Slope Stabilization** shall include all excavation and backfill, all materials and installation, all testing and monitoring, as described on Design Plans and this Specification.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
STRUCTURE SURVEY DURING CONSTRUCTION

STR:BMW 1 of 4 APPR:KCK:JAB:04-21-22
FHWA:APPR:05-05-22

a. Description. This work consists of obtaining elevation observations along existing and proposed beams or girders at the stages of construction set forth in this special provision. Complete all work in accordance with section 824 of the Standard Specifications for Construction, except as modified herein.

Submit the qualifications of the survey crew chief used to complete this work for review and approval by the Engineer in accordance with subsection 824.01 of the Standard Specifications for Construction.

b. Materials. None specified.

c. Construction. Witness horizontal control points in accordance with subsection 824.03.A of the Standard Specifications for Construction and verify plan benchmarks and establish new benchmarks in accordance with subsection 824.03.B of the Standard Specifications for Construction prior to starting work.

Furnish the Engineer with elevation observations at the same points along the existing and proposed beams or girders as the bottom of slab and screed point locations included on the plans and at the stages of construction listed below. Measure the elevations requested to an accuracy of 0.01 feet. Furnish the information using the Bridge Elevation Table spreadsheet included in the Reference Information Documents (RID).

1. Deck Replacement Projects.

A. Elevation observations along the bottom of the bottom flange of the existing beams or girders prior to the removal of any of the existing superstructure and without any live load or materials or equipment stored on top of the existing superstructure.

As an alternative to bottom flange elevations, the Contractor may elect to remove portions of the deck to permit access to obtain the required elevations on the top flange. Deck concrete removal is limited to an area with length and width not exceeding the smaller of the flange width or 18 inches, at each survey location. Ensure access is sufficient to positively identify the top of the beam flange and to mark the beam at each survey location to ensure repeatability during successive stages. Core drilling is prohibited.

B. Elevation observations along the top of the top flange or bottom of the bottom flange of the existing beams or girders after the existing bridge deck has been removed and prior to installing forms or reinforcement. Include information regarding any false decking and/or fascia walkways in place. Submit to the Engineer and obtain approval prior to beginning installation of deck formwork.

C. Elevation observations along the top of the top flange or bottom of the bottom flange of the existing beams or girders after installing the forms and reinforcement and prior to placing the superstructure concrete. Include formwork information.

D. Elevation observations along the bottom of the bottom flange of the existing beams or girders after the proposed superstructure is complete and without any live load or materials or equipment stored on top of the proposed superstructure. Furnish these elevations no more than 7 calendar days after completing placement of all superstructure concrete, including deck slab, sidewalks, and concrete barriers.

2. Projects with a New Prestressed Concrete Superstructure.

A. Obtain the initial camber measurement and prestressing force release date from the precast concrete fabricator and submit along with item B, of this subsection.

B. Elevation observations relative to a local datum, with an elevation of 100.00 feet at one end of the proposed prestressed concrete beam, along the top of the proposed beams while they are still at the precaster's facility as soon after strand release as possible. Coordinate access to the precaster's facility. Measure the height of the beam at the point of each elevation observation and furnish this information to the Engineer. Complete this work within 14 days of release of prestressing force. Indicate the distance from the end of each beam to the support location at the time elevations are surveyed.

Prior to conducting any data collection/survey work at a precaster's facility furnish the precaster copies of completed certificates of insurance proving the workers carry Workers' Compensation Insurance and General Liability Insurance.

C. Elevation observations along the top of the proposed prestressed concrete beams after they have been erected on the abutments and piers and prior to installing forms or reinforcement. Include information regarding any false decking and/or fascia walkways in place.

Submit items A, B and C to the Engineer and obtain approval prior to beginning installation of deck formwork.

D. Elevation observations along the top of the top flange or bottom of the bottom flange of the proposed prestressed concrete beams after installing forms and reinforcement and prior to placing the superstructure concrete. Include formwork information.

E. Elevation observations along the bottom of the bottom flange of the proposed prestressed concrete beams after the proposed superstructure is complete and without any live load or materials or equipment stored on top of the proposed superstructure. Furnish these elevations no more than 7 calendar days after completing placement of the superstructure concrete, including deck slab, sidewalks, and concrete barriers.

3. Projects with a New Steel Superstructure.

A. Elevation observations along the top and bottom of the proposed steel beams or girders after they have been erected on the abutments and piers and prior to installing

forms or reinforcement. Height measurements may be utilized to calculate bottom elevations. Compare heights to plan dimensions and report any discrepancies. Include information regarding any false decking and/or fascia walkways in place. Submit to the Engineer and obtain approval prior to beginning installation of deck formwork.

B. Elevation observations along the top of the top flange or bottom of the bottom flange of the proposed beams or girders after installing the forms and reinforcement and prior to placing the superstructure concrete. Include formwork information.

C. Elevation observations along the bottom of the bottom flange of the proposed beams or girders after the proposed superstructure is complete and without any live load or materials or equipment stored on top of the proposed superstructure. Furnish these elevations no more than 7 calendar days after completing placement of the superstructure concrete.

4. Superstructure Widening Projects. Furnish the information specified above for deck replacement projects for the existing beams or girders that will remain in place. Furnish the information specified above for projects with a new prestressed concrete superstructure or for projects with a new steel superstructure for the proposed beams or girders.

5. Submit the following information with the elevation observations for all projects:

A. False Decking.

(1) Material type(s).

(2) Material dimension(s).

(3) False decking layout.

B. Formwork.

(1) Material type(s).

(2) Material dimension(s).

(3) Formwork layout.

For elevation observations required prior to placement of forms or reinforcement, submit a complete set of elevations and other required information to the Engineer for review and approval. The Engineer will have up to 7 calendar days to review for approval, and may elect to adjust the proposed bottom of slab and screed elevations following a review of the documentation. Do not place any deck formwork prior to Engineer review and approval of the required elevation observations.

d. Measurement and Payment. The completed work, as described, will be measured as a lump sum and paid for at the contract price using the following pay item:

Pay Item	**Pay Unit**
Structure Survey During Construction (Structure Identification)	Lump Sum

Structure Survey During Construction (Structure Identification) includes all costs associated with access, coordination, traffic control, collection, and distribution of the surveyed measurements required by this special provision.

Any additional work associated with deck concrete removal to access the top flange for elevations prior to deck removal will not be paid separately but is included in payment for the deck removal pay item.

The pay item will include partial payments using the following milestone schedule.

1. Approval of all items required prior to placement of forms and reinforcement: 50 percent.

2. Acceptance of final grades after completion of superstructure concrete placement: 50 percent.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
INDUSTRIAL BY-PRODUCTS AND BENEFICIAL RE-USE

HYD:HLZ 1 of 1 APPR:JJG:JFS:04-02-20
FHWA:APPR:04-03-20

a. Description. For this project, regardless of the application, the use of industrial by-products covered in 2014 PA 178 is prohibited unless the use and application of a particular material is covered elsewhere in the contract.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
PORTLAND CEMENT (TYPE IL)

CFS:JFS 1 of 2 APPR:TES:TEB:12-14-21
FHWA:APPR:12-16-21

a. Description. The Contractor may substitute Type IL Portland cement in lieu of Type I Portland cement for concrete mixtures and other applications where Type I Portland cement is specified, provided documentation showing specification compliance is provided as described herein.

The Contractor must provide the Engineer a minimum of 14 calendar days prior notification of their intent to substitute Type IL Portland cement in lieu of Type I Portland cement for the project.

b. Materials. Furnish Type IL Portland cement in accordance with section 901 of the Standard Specifications for Construction meeting the chemical and physical requirements specified in *ASTM C595/C595M*, *Standard Specifications for Blended Hydraulic Cements*. Ensure the Type IL Portland cement proposed for substitution is from the same Approved Manufacturer as the Type I Portland cement in the approved JMF.

c. Construction. At least 7 days prior to concrete production, the concrete producer must provide test data (specified below) generated from a four cubic yard (minimum) trial batch of concrete using Type IL Portland cement for the Engineer's review and approval. The trial batch must represent a current approved JMF for either a standard MDOT Grade 3500, Grade 3500HP, Grade 4500, or Grade 4500HP concrete mixture produced using Type I Portland cement, as described in section 1004 of the Standard Specifications for Construction. Ensure the materials and mixture proportions for the Type IL JMF are the same as those documented in the above mentioned JMF using Type I Portland cement. Minor adjustments to chemical admixture dosages are permitted in efforts to achieve the specified fresh concrete properties. Trial batch compliance for applications other than Portland cement concrete mixtures will be in accordance with the contract.

1. Fresh Concrete Properties.

   A. Concrete temperature,

   B. Air content of fresh concrete, and

   C. Slump.

2. Hardened Concrete Properties.

   A. 7-day compressive strength.

The Engineer will review the trial batch test data to determine if the fresh and hardened concrete properties of the Type IL JMF meet specification requirements for the respective MDOT Grade of

concrete represented by the trial batch. If the Engineer determines that the trial batch test data are in conformance with specification requirements, then the Type IL Portland cement will be permitted to be substituted in lieu of the Type I Portland cement for all approved concrete mixtures generated at the concrete production facility for the project. If the Engineer determines that the trial batch test data do not meet specification requirements for the respective MDOT Grade of concrete, the Contractor will not be permitted to substitute Type IL Portland cement in lieu of Type I Portland cement. Mix design and JMF documentation for concrete mixtures using Type IL Portland cement will then be required in accordance with subsection 1003.03.C of the Standard Specifications for Construction or the contract, where applicable.

Once Type IL Portland cement is approved for use on the project, reinstatement of Type I Portland cement into the JMF is not permitted. Substitution of other material types or sources, including admixtures, as documented in the initial Type I JMF is not permitted.

The Engineer will complete field sampling and testing for all production lots containing Type I Portland cement JMF prior to respective Type IL Portland cement substitution. Do not include concrete mixtures containing Type I and Type IL Portland cement types in the same production lot.

d. Acceptance. The Contractor may substitute Type IL Portland cement in lieu of Type I Portland cement for the project with no additional laboratory trial batch requirements, as described in subsection 1003.03.C.2.a of the Standard Specifications for Construction, provided the Engineer has reviewed the concrete producer's test data generated from a four cubic yard (minimum) trial batch of concrete, described above, and has determined that the fresh and hardened concrete properties of the Type IL JMF meet specification requirements for the respective MDOT Grade of concrete represented by the trial batch.

e. Measurement and Payment. The work included in this special provision will not be paid for separately and is included in other pay items in the contract.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
MICRONIZED COPPER WATER BASED WOOD PRESERVATIVE SYSTEMS

STR:SCK 1 of 1 APPR:HLZ:POJ:04-13-20
FHWA:APPR:04-13-20

a. Description. Micronized copper water based wood preservative systems are an alternate to the preservative systems identified in section 912 of the Standard Specifications for Construction, except on wood posts used for signing. Micronized copper water based wood preservative systems are proprietary systems used to treat timber and lumber for resistance to insect attack, decay, and rot. Proprietary micronized copper based wood preservative systems are evaluated by the *International Code Council Evaluation Service, Inc (ICC-ES)*. This special provision covers the requirements for micronized copper azole (MCA) and micronized copper quaternary (MCQ).

b. Materials. *ICC-ES* requirements and specified commercial standards are incorporated herein by reference. Treated wood product reports issued by the *ICC-ES* as Evaluation Service Reports (ESRs) must be current as posted on the *ICC-ES* website www.icc-es.org and in compliance with AC326. The preservative(s) must not contain arsenic. The treated wood product's report must allow for the wood species and end use that is required by the project specifications. The Contractor must provide test data certification for each lot, that the treated timber and lumber meets the retention requirements of the appropriate *AWPA* Use Category.

Condition and treat timber and lumber for above ground use to the minimum preservative retention corresponding to *AWPA* Use Category 4A (UC4A). Condition and treat timber and lumber for ground contact to the minimum preservative retention corresponding to *AWPA* Use Category 4B (UC4B).

Condition and treat all round posts, except northern white cedar, to the minimum preservative retention corresponding to *AWPA* Use Category 4B (UC4B).

Incorporation of timber and lumber treated to the preservative retention in *AWPA* Use Category 3B (UC3B) or less is not permitted. Timber and lumber placed in violation of this special provision is cause for removal and replacement at the contractor's expense. No pay adjustments will be allowed for incorporation of timber and lumber treated to UC3B preservative retention. Removal is required.

c. Construction. Use stainless steel fasteners or hot dipped galvanized fasteners in accordance with *ASTM A653/A653M*, batch or post-dipped process, with a minimum coating thickness of 1.85 oz of Zinc per square foot of surface area (G185). Do not mix fastener types. Do not use aluminum fasteners. Aluminum must not be in direct contact with treated wood. Non metallic spacers are to be used where contact with aluminum could occur.

d. Measurement and Payment. Payment is included in other items of work.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
SAWN TIMBER POSTS AND BLOCKS FOR BEAM GUARDRAIL AND HIGHWAY SIGNS

STR:SCK 1 of 1 APPR:MWB:CT:04-02-20
FHWA:APPR:04-03-20

Delete subsection 912.08.C of the Standard Specifications for Construction in its entirety and replace with the following:

C. **Incising.** Incising blocks is not required. The Engineer may waive the incising requirement for posts if the Contractor can meet penetration and retention requirements without incising. Ensure the incisor has teeth a nominal 7/8 inches long to make cuts spaced 2½ inches apart lengthwise in rows 3/4 inch apart. Ensure alternate rows are staggered by 1¼ inches to provide 60 diamond patterns of incisions per square foot. Ensure the diamonds are 2½ inches long and 1½ inches wide from center to center. The Contractor may incise southern pine with 3/4 inch teeth.

As an alternative, the Contractor may incise posts in accordance with the *AREMA* Manual for Railway Engineering, Article 3.6.2.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
TEMPORARY PAVEMENT MARKING, TYPE R TAPE REVISION

COS:CRB 1 of 1 APPR:LLR:MKB:04-18-22
FHWA:APPR:05-05-22

Delete subsection 922.06.A.1 of the Standard Specifications for Construction, in its entirety and replace with the following:

1. **Pavement Marking, Wet Reflective, Type R.** Provide wet reflective Type R temporary pavement marking as preformed tape. Apply and remove preformed tape in accordance with the manufacturer's instructions. The tape must remain flexible and conform to the texture of the pavement surface during use. Select one of the following materials:

   a. 3M ™ Stamark™ Wet Reflective Removable Tape Series IR710 White manufactured by 3M Traffic Safety & Security Division, 3M Center, 225-4N-14 St. Paul, MN, 55144, (800)-553-1380.

   b. 3M ™ Stamark™ Wet Reflective Removable Tape Series IR711 Yellow manufactured by 3M Traffic Safety & Security Division, 3M Center, 225-4N-14 St. Paul, MN, 55144, (800)-553-1380.

   c. Deltaline Temporary Wet Reflective/TWR-HP white manufactured by Brite-line LLC 10660 East 51st Ave. Denver, CO 80239, phone 303-375-1293.

   d. Deltaline Temporary Wet Reflective/TWR-HP yellow manufactured by Brite-line LLC 10660 East 51st Ave. Denver, CO 80239, phone 303-375-1293.

   Local Agencies may use a material listed above or select wet reflective Type R markings from the Qualified Products List (922.06A).

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SUPPLEMENTAL SPECIFICATION
FOR
ERRATA TO THE 2020 STANDARD SPECIFICATIONS

Page	Subsection	Errata
1-06	101.02	Delete the second abbreviation of the list on this page reading: “IES .....Illuminating Engineering Society
1-06	101.02	Add the abbreviation to the list on this page reading: “IESNA Illuminating Engineering Society of North America
1-83	108.05.A.2	In the first paragraph of this subsection change the language “MDOT Form 1130” to read “MDOT Form 1130A”.
1-88	108.08.D	Move the last paragraph of this subsection to the left one indent to align with the first paragraph of the subsection and not with the subsection 108.08.D.3.
2-29	205.03.P.1	Delete the first sentence of this subsection and replace with the following: “Do not dispose of material, temporarily or permanently, beyond the normal plan fill slope across wetlands or floodplains.”
2-30	205.03.P.2	Delete the first sentence of this subsection and replace with the following: “Do not dispose of material, temporarily or permanently, in wetlands or floodplains.”
2-30	205.03.P.3	Delete the second paragraph of this subsection and replace with the following: “Contact the appropriate regulatory agencies to determine whether an area is a regulated wetland or floodplain before disposing of surplus or unsuitable material in areas outside the right-of-way and not shown on the plans as disposal sites.”
2-30	205.03.P.3	Delete the first sentence of the third paragraph of this subsection and replace with the following: “Immediately move to an upland site any surplus or unsuitable material that was disposed of in portions of wetlands or floodplains not shown on the plans as disposal sites, at no additional cost to the Department.”
2-30	205.03.P.4	Delete the first sentence of this subsection and replace with the following:

		"The Department will notify the applicable regulatory agencies if the Department becomes aware that the Contractor disposed of surplus or unsuitable material in portions of a wetland or floodplain not shown on the plans."
3-31	308.04.D	Change the subsection title from "D. **General**." to read "A. **General**."
4-7	401.03.E	Delete the third sentence of the second paragraph of this subsection and replace with the following: "Use precast or cast-in-place footings for precast end sections as required."
4-8	401.03.E	Delete the first sentence of this subsection and replace with the following: "When discharging stormwater directly to waters of the state, permanently label all end sections or other piped points of stormwater entry with "MDOT" or the local agency's name in a conspicuous location that will remain visible after construction.
4-11	401.04	Change the eighth pay item from the bottom of the list on this page to read as follows: Culv End Sect __ inch, Grate.....Each
4-12	401.04.C.4	Change this subsection to read: "The Engineer will measure Culv End Sect __ inch, Grate by each as shown on the plans for the size of grate required."
4-21	402.03	Add a new subsection to the end of subsection 402.03 on this page reading as follows: "K. **Outfall Labeling.** Label all stormwater outfalls directly discharging to waters of the state in accordance with subsection 401.03.E.
4-39	406.02	Change the third line in the list of materials to read: Coarse Aggregate 6A, 6AA, 17A.....902
4-41	406.03.A.3	Delete the third paragraph of this subsection and replace with the following: "Design joints between adjacent box culvert sections in accordance with Section 9 of ASTM C1577 and to accommodate the joint sealing material in accordance with section 914 as applicable."
4-50	406.03.G.3	Change the first sentence of the first paragraph to read: "Unless otherwise shown on the plans, construct culvert bedding for box culverts by placing a 9-inch-thick layer of 46G aggregate, covered with a 3-inch-thick layer of 34G, 34R aggregate, or approved equal."
4-51	406.03.G.3	Add the following sentence to the end of the second paragraph of this subsection:

		"The cold applied joint sealer must completely cover the external rubber gasket with the placement limits matching the width of the geotextile blanket."
4-52	406.04.B	In the second paragraph of this subsection delete the first sentence and replace with the following: "The Department will pay separately for cast-in-place concrete, other than for culvert segments, headwalls, wingwalls, aprons, and curtain walls."
5-26	502.02	Delete the first sentence of the subsection and the listed materials in this subsection.
5-26	502.02.A	Add the following to the end of the first sentence in this subsection: "(914.04A)"
5-26	502.02.B	Add the following to the end of the first sentence in this subsection: "(502.02B)"
5-35	503.04	Change the first paragraph to read: "The unit price for **Paver-Placed Surface Seal**, of the type required, includes the cost of preparing the surface, and placing a membrane and paver placed surface seal course for full-width coverage, except that the Department will pay separately for removing pavement markings in accordance with subsection 812.04"
5-46	504.04.A	Change the first paragraph to read: "A. **General**. The unit prices for **Micro-Surface**, regardless of the type required, include cleaning existing pavement, applying a bond coat, stationing, corrective action, and traffic control to complete corrective action."
6-20	602.04	Delete the fifteenth pay item of the list on this page reading: "Shoulder, Reinf Conc.....Square Yard
6-20	602.04	Change the sixteenth thru the eighteenth pay items on this page to read as follows: Shld, Nonreinf Conc.....Square Yard Shld, Nonreinf Conc, High Performance .....Square Yard Shld, Freeway.....Square Yard
6-21	602.04.B.1	Delete this subsection and replace with the following: "**Shld, Nonreinf Conc;** and **Shld, Nonreinf Conc, High Performance.** The Engineer will measure, and the Department will pay for, **Shld, Nonreinf Conc;** and **Shld, Nonreinf Conc, High Performance** by area, based on plan quantities in accordance with subsection 109.01."
6-21	602.04.B.2	Delete this subsection and replace with the following: "**Shld, Freeway.** The Engineer will measure, and the Department will pay for, **Shld, Freeway** based on plan quantities in accordance

with subsection 109.01. If the Contractor uses concrete for the shoulder, the unit price for **Shld, Freeway** includes the cost of the transverse joints in the shoulder and the external longitudinal pavement joints."

6-23	602.04.F	Add the following sentence to the end of the first paragraph of this subsection: Temporary concrete pavement, pavement within 4 feet of an obstruction, pavement areas less than 300 square yards, or pavement less than 3 feet wide will not be cored.
6-23	602.04.F	Delete the following language from this subsection on this page: "The Engineer will not core the following: 1. Temporary concrete pavement; 2. Pavement within 4 feet of an obstruction; 3. Pavement areas less than 300 square yards; or 4. Pavement less than 3 feet wide."
6-24	602.04	Rename the following subsections as follows: "1. Initial Core.
6-24	602.04	2. Additional Cores.
6-24	602.04	3. Price Adjustment for Thickness.
6-25	602.04	4. Price Adjustments for Steel Locations within the Pavement.
6-26	602.04	5. Remove and Replace."
7-107	709.04	Change the Pay Unit on the second pay item from the top of the list on this page to read as follows: Thousand Board Foot
8-12	804.03.B.2	Change the first sentence in this subsection to read: "Cast in place light standard and sign support foundations using fixed forms in accordance with the *MDOT Standard Plan R-50 series."*
8-27		Change the last pay item at the bottom of this page to read as follows: Guardrail Anch, Bridge, Det __, Curved.....Each
8-44	810.03.J.9	Add a period to the end of the third sentence in this subsection.
8-53	810.03.V	Add a period to the end of the second sentence of the first paragraph of this subsection.
8-53	810.04	Change the fourth pay item from the top of the list on this page to read as follows: Post, Steel, __ pound.....Foot

8-53	810.04	Change the last four pay items at the bottom of this page to read as follows: Fdn, Truss Sign Structure Type __, __ inch dia, Cased.....Foot Fdn, Truss Sign Structure Type __, __ inch dia, Uncased.....Foot Fdn, Cantilever Sign Structure Type __, __ inch dia, Cased ....Foot Fdn, Cantilever Sign Structure Type __, __ inch dia, Uncased.Foot
8-55	810.04.B.1	Delete the second paragraph of this subsection and replace with the following: "The unit prices for **Fdn, Truss Sign Structure Type __, __ inch dia, Cased** and **Fdn, Cantilever Sign Structure Type __, __ inch dia, Cased** include the cost of concrete, slurry, steel reinforcement, permanent casings, anchor bolts, excavation, and disposal of excavated material."
8-55	810.04.B.2	Delete this subsection and replace with the following: "**Foundation, Truss Sign Structure, Uncased and Foundation, Cantilever Sign Structure, Uncased.** The unit prices for **Fdn, Truss Sign Structure Type __, __ inch dia, Uncased** and **Fdn, Cantilever Sign Structure Type __, __ inch dia, Uncased** include the cost of concrete, slurry, steel reinforcement, temporary casings, anchor bolts, excavation, and disposal of excavated material."
8-57	810.04.I	Delete the first paragraph of this subsection and replace with the following: "The unit price for **Sign, Rem** of the type required includes the cost of removing signs from supports and stacking by shape and size."
8-57	810.04.I	Delete the second paragraph of this subsection and replace with the following: "The unit prices for **Ground Mtd Sign Supports, Rem**; **Cantilever, Rem** and **Truss, Rem** include the cost of removing ground mounted sign supports, cantilever or truss supports."
8-57	810.04.L	Change this subsection to read: "The unit price for Sign, Erect, Salv of the type required includes erecting the salvaged sign on a new sign support or existing sign support, as shown on the plans, and attaching devices, and hardware, including brackets."
8-58	810.04.N	Delete this subsection in its entirety.
8-110	812.04	Change the fifth and sixth pay item from the top of the list on this page to read as follows: Sign, Type B, Temp, Prismatic, Spec, Furn ..... Square Foot Sign, Type B, Temp, Prismatic, Spec, Oper..... Square Foot
8-141	815.04.C.1.b	Delete this subsection in its entirety.
8-141	815.04.C.1.c	Rename and change this subsection as follows:

"b. Removal and disposal of unacceptable plants including the root ball.

8-141	815.04.C.1.d	Delete this subsection in its entirety.
8-142	815.04.C.2.d	Change this subsection to read: "During the first watering of the second growing season, remove and dispose of the guying material, identification tags, and inspection tags."
8-144	816.03.A	Change the third sentence in this subsection to read: "Use topsoil from within the project limits; or from off-site sources meeting the requirements in subsection 917.06."
8-167	818.04	Add the pay item to the bottom of the list on this page as follows: Power Company (Estimated Cost to Contractor)..... Dollar
8-170	818.04.G	Delete this subsection in its entirety.
8-170	818.04	Rename the following subsections as follows: "G. **Handholes (Hh).**
8-171	818.04	H. **Service Disconnect.**
8-171	818.04	I. **Metered Service.**
8-171	818.04	J. **Unmetered Service.**
8-172	818.04	K. **Wood Pole.**
8-172	818.04	L. **Concrete Pole, Fit Up.**
8-172	818.04	M. **Steel Pole, Fit Up.**
8-172	818.04	N. **Bracket Arm.**"
8-171	818.04.J	Delete the second paragraph of this subsection and replace with the following: "The pay item, **Power Company (Estimated Cost to Contractor)**, establishes a budgeted amount in the contract to cover the cost of reimbursing the Contractor for payments made to the power company for providing electrical power at the locations shown on the plans. The Department will estimate the reimbursement costs to the Contractor and establish a budgeted amount as shown on the plans. The Department will pay the Contractor for power company invoices paid, as submitted to the Engineer."
8-176	819.03.B.5.b	In the second paragraph of this subsection delete the first sentence and replace with the following: "Tighten bolts connecting the pole to the frangible base to a snug tight condition in accordance with subsection 707.03.E.6.c."
8-185	820.01.B	Add a period to the end of the first sentence of this subsection.
8-187	820.02	Change the first line in the list of materials on this page to read: Conduit Material.....918

8-196	820.03.O	In the fourth paragraph of this subsection delete the last sentence and replace with the following: “Use smooth wall, Schedule 80, rigid PVC conduit, or coilable, Schedule 80 PE conduit in accordance with section 818.”
8-199	820.04	Add the pay item to the list on this page: TS, (number) Way (type) Mtd (LED) Optic
8-200	820.04	Change the second pay item from the top of the list on this page to read as follows: TS Head, Temp .....Each
8-200	820.04	Change the eleventh pay item from the top of the list on this page to read as follows: TS, Lens, Pedestrian Sym (LED) .....Each
8-200	820.04	Delete the following pay items from the list: Strain Pole, Steel, 6 bolt, __ foot.....Each Mast Arm Pole, Cat__.....Each Mast Arm, __Foot, Cat.....Each
8-200	820.04	Change the eleventh pay item from the bottom of the list on this page to read as follows: Mast Arm, Rem.....Each
8-201	820.04	Delete the following pay item from the list: Power Co. (Est Cost to Contractor)..... Dollar
8-202	820.04	Add the following pay item to the list: Bracket, Truss, Salv.....Each
8-204	820.04.C	Delete the last paragraph of this subsection in its entirety.
8-204	820.04.D	Delete the first paragraph of this subsection in its entirety.
9-9	902.03.C.1.b	Delete the first sentence in this subsection and replace with the following: “The physical requirements for the coarse aggregate are as specified in Table 902-2 and as follows:”
9-16	Table 902-2	Delete the superscript footnote in the first through fourth rows under the header row that reads “(m)” in the column Loss, % max, LA Abrasion (MTM 102).
9-16	Table 902-2	Add the superscript footnote in the header row that reads “(m)” in the column Loss, % max, LA Abrasion (MTM 102).
9-15	Table 902-2	Delete the footnote (d) in one location in the table.
9-17	Table 902-2	Delete the footnote (d) in one location in the table.

9-21	Table 902-6	Delete the footnote (b) in two locations in the table.
9-21	Table 902-6	Change the footnote (c) to read (b) in two locations in the table.
9-21	Table 902-6	Change the footnote (d) to read (c) in two locations in the table.
9-70	909.05.D	Change the first sentence in this subsection to read: "Provide steel pipe for jacking in place meeting the requirements of ASTM A53/A53M for Type E or Type S, Grade B, or ASTM A139/A139M for Grade B.*"*
9-94	Table 910-01	Change the value in the fifth row under the header row in the Permittivity (min) (per second) column from 0.5 to read: "0.05"
9-94	Table 910-01	Change the value in the seveth row under the header row in the Permittivity (min.) (per second) column from 0.5 to read: "0.05"
9-95	Table 910-2	Change the second row under the Ultimate strength section to read: "CMD[(c)] 1950 lb/ft"
9-119	913.06	Change this subsection to read: Circular precast concrete units with circular reinforcement for adjusting rings, tops, risers, and sump bases for manholes, catch basins, and inlets must meet the requirements of AASHTO M199 and the following additions and exceptions:
9-133	917.03	Rename the four subsections following the first paragraph on this page as follows: D. Deciduous Shade Trees. E. Small Trees, Ornamentals, and Shrubs. F. Evergreen Trees. G. Vines, Ground Cover, and Herbaceous Ornamental Plants.
9-149	918.08	In the first paragraph of this subsection delete the second sentence and replace with the following: "Provide light standards designed in accordance with AASHTO's LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals."
9-150	918.10	In the first paragraph of this subsection delete the first sentence and replace with the following: "Provide tower lighting units designed in accordance with AASHTO's LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals."
9-164	919.04.B	In the first paragraph of this subsection delete the first sentence and replace with the following: "Provide square tubular steel sign supports meeting the chemical, mechanical, and geometric properties of material used in the crash

		tests referenced in AASHTO's LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals."
9-170	920.02.C	Change the reference to Table 920-2 to read Table 920-3 in two locations.
9-222	922.10.A.3	Delete this subsection and replace with the following: "Conform to the wind load requirements specified by AASHTO's LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals with all equipment mounted without the need for additional ballast;"
10-23	1003.03.B	Delete the last sentence of this subsection and replace with the following: "Aggregate sampling for concrete will be performed by an MCAT-certified Aggregate Technician Level II."
10-43	Table 1006-02	Replace Table 1006-02 with the Table 1006-02 below.
1A - 20A	Pay Item Index	Replace the Pay Item Index in its entirety.

Table 1006-2:
Overlay Mixtures

Mixture Type	Aggregate	Slump (inch)	Air Content	Admixture Required	Mixture Proportions lb/yd³, dry weight					
					Cement[a]	Dry Densified Silica Fume[b]	Net Mix Water	Fine Agg	Coarse Agg	Latex Admixture
SFMC	2NS and 26A[c]	4–6	6.5 ±1.5%	[d],[e],[f]	618	40	273[g]	1273	1601	—
LMC	2NS and 26A[c]	[h]	4.5 ±1.5%	—	658	—	[h]	1490[i],[j]	1300[i],[j]	206

(a) Use only Type I Portland cement.

(b) For SFMC mixtures, the Contractor may use a blended silica fume Portland cement. However, if the silica fume content of the blended material is greater than 8% of the total cementitious material, submit to the Engineer modified mix proportions with Type I Portland cement added to the blended material to achieve the equivalent individual cementitious material mixture proportions.

(c) Provide coarse aggregate, 95% minimum crushed materials in accordance with Michigan Test Method (MTM) 117, with an absorption no greater than 2.5%, in accordance with ASTM C127.

(d) Water-reducing high-range admixture or water-reducing high-range and retarding admixture.

(e) Virgin polypropylene collated fibers at 2 lb/yd³.

(f) Air-entraining admixture.

(g) Provide a net water to cementitious material ratio of 0.41 (cementitious material includes cement and silica fume).

(h) Add water in addition to water in the latex admixture to control slump to within 3 to 5 inches. Measure slump from 4 to 5 minutes after discharge from the mixer. During the waiting period, deposit concrete on the deck and do not disturb. If placing mixtures on sections within superelevated curves, the Contractor may need to use the lower allowable range of the slump requirement, as determined by the Engineer. Do not exceed water-cement ratio, by weight, of 0.30 including water contained in the latex emulsion.

(i) Aggregate proportions are approximate; due to gradation changes, the Contractor may increase proportions by no greater than 5% by weight of total aggregate if reducing coarse aggregate by an equivalent volume.

(j) Aggregate weights specified in the table are based on a dry bulk specific gravity of 2.65 for gravel and stone. Adjust the weights if the specific gravity of the materials used varies by more than 0.02 from the specified values.

1. GENERAL

1.1. Introduction and Purpose

Track monitoring is a method of ensuring the integrity of track geometry during construction work that could affect track stability, called Roadbed Disturbing Work. This includes any earth disturbing construction activity either under the track (called underground crossing work) or within 50 feet of the centerline of the nearest track effecting the theoretical railroad embankment line as shown on Figure 1 (called parallel work).

Examples of the types of projects in which track monitoring is required:

- Underground pipe crossings by jacking or horizontal directional drilling
- Local work, such as for foundation excavation or ground dewatering.
- Excavation that is parallel to the track, such as construction of ditch or utility trench.
- Pile driving adjacent to the track, such as construction of an access road.

The purpose of track monitoring is to record railroad track geometry data before, during, and after the completion of construction. The collected geometry data is compared to determine if the track has been adversely affected by construction. If the track has been adversely affected, the data can be used to alert Amtrak personnel to take appropriate action and reestablish pre-construction conditions.

1.2. Related Documents

Amtrak Structures EP 3005 – Pipleline Occupancy

Amtrak Structures EP 3005, Spec. 02082A - Additional Requirements for Horizontal Directional Drilling (HDD) / Directional Boring

Amtrak Track Department Frac-Out Contingency Plan (FCP) (included in Structures EP 3005, Spec. 02082A)

Amtrak Structures EP 3014, Spec. 02261 - Requirements for Temporary Sheeting and Shoring to Support Amtrak Tracks

Amtrak Land Surveying Standards and Procedures Manual, Version 2.0

1.3. Responsibilities

Contractor responsibilities:

- Using proven surveying methods and materials to establish Remote Monitoring Points (RMPs) for collection of track data.
- Gathering and recording track data before construction starts.

- Gather, recording, and report track geometry data at pre-determined time intervals during construction.
- Comparing pre-construction and during-construction data to determine if differential movement has occurred.
- Report track monitoring data and comparison to Amtrak Construction Project Manager, Assistant Division Engineer of Track, and System Track Contracting Office Technical Representative (COTR).
- Pay for any repairs required if track movement meets or exceeds 3/8-inch in any direction or creates conditions exceeding track geometry maintenance limits as defined in the MW1000 for the class of track concerned.

Amtrak responsibilities:

- Amtrak will identify and provide contact information for the following: System Track COTR for track monitoring, the Assistant Division Engineer of Track responsible for maintenance, and the Construction Project Manager.
- Prior to construction Amtrak will review/approve the submitted Track Monitoring Plan.
- Schedule Track Inspector to cover the anticipated duration of roadbed disturbing work.
- Monitor track movement and prescribe repairs, restrictions, or removal tracks from service to ensure the safety of train operations.

2. METHODS & MATERIALS

2.1. Surveying Requirements

Surveyor in charge of performing track monitoring must be working under the direct supervision of a professional land surveyor duly registered in the state. Contract Surveyors must have working knowledge of Amtrak Survey Specification and have current Contractor Orientation Training credentials.

Datum and accuracy will be in accordance with Amtrak Land Surveying Standards and Procedures Manual, Version 2.0:

Datums – NAD 83 with appropriate UTM Zone - NAVD 88
All coordinates in US survey feet.
Horizontal and vertical accuracy 0.01-feet (1/8-inch) for all reports.

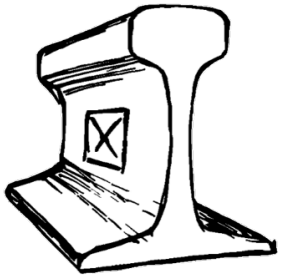
Control must be verified before and during construction with frequency sufficiency to ensure continued accuracy.

2.2. Equipment Requirements

Monitoring shall be performed by a total station instrument having a minimum angular accuracy of 1-second and an electronic distance measurement accuracy of 1.0mm + 2ppm. Total station will locate Remote Monitoring Points (RMPs) located on the track to be monitored.

Points should be either commercially available calibrated reflective targets or small prisms. All targets shall be mounted a uniform elevation below top of rail.

- Reflective targets shall be less than 3-inches square and affixed by adhesive to the web of the rail (as shown). Common types are shown in figure 1 but are not exclusive. Minimum angle of 30º from instrument to target face is allowed. Therefore, multiple target types may be used to aid in visibility from the instrument. During application the rail should be spot cleaned and dried to allow good adhesion.
- Small precise prisms shall remain at least 1-inch below the top of rail. They are typically on a bracket clamped to the base of the rail and must not interfere with track components.



3. MONITORING POINT LOCATIONS

3.1. General Instructions

Benchmarks to be occupied including foresights and back sights, shall be outside of the ZOI for the roadbed disturbing work.

RMPs will be installed as pairs, with one target on each rail of the track to be monitored. The pairs shall be set perpendicular to the direction of the rails to allow for measurement of cross-level.

Pairs of RMPs will be spaced along the rails at 15.5-foot intervals. In locations of special track work (i.e.- turnouts, crossings, and miter rails) the System Track COTR will determine an alternate arrangement.

3.2. Underground Crossing Work

This method for RMPs is applicable for underground work that enters Zone 3 shown on Figure 2 and/or crosses under the tracks.

Determine the Zone of Influence for the underground crossing work at the elevation of the bottom of railroad tie. Calculate by taking the diameter or width of the underground work, extending to the ground surface at the soil angle of repose. Soil angle of repose should be taken from soil borings performed at the crossing location that cover the depth from track level to the depth of underground work. If soil boring data is not available or does not satisfy the System Track COTR, use 20º as a conservative soil angle of repose. See Figure 2 for an example.

In each direction starting from the intersection of the centerlines of underground work and track, place RMPs every 15.5-feet until the monitoring point pairs are outside the Zone of Influence. Continue the RMPs for five pairs outside of the ZOI for a tie-in with undisturbed track. Refer to Figure 3 for an example.

3.3. Work Parallel to Track

This method for placing RMPs is applicable for underground work that enters either Zone 2 or Zone 3 from figure 2, that does not cross under the tracks.

Determine the Zone of Influence for the underground crossing work at the elevation of the bottom of railroad tie. Calculate by taking the lowest elevation limits of the underground work, extending to the ground surface at the soil angle of repose. Soil angle of repose should be taken from soil borings performed at the crossing location that cover the depth from track level to the depth of underground work. If soil boring data is not available or does not satisfy the System Track COTR, use 20º as a conservative soil angle of repose. See Figure 4 for an example.

Any place the ZOI intersects Zone 2 from Figure 1 requires monitoring for the track directly perpendicular to the intersection of ZOI and Zone 2. In each direction, place RMPs every 15.5-feet until the RMP pairs are outside the Zone of Influence. Continue the RMPs for five pairs outside of the ZOI for a tie-in with undisturbed track. See Figure 5 for an example.

4. PRECONSTRUCTION ACTIVITIES

4.1. Track Monitoring Plan Submittal

Track Monitoring Plan shall be submitted a minimum of 4-weeks prior to commencement of roadbed disturbing work. The System Track COTR will review and provide comments or approval. As a minimum, the package must include the following:

- Information on the registration and experience of the field surveyor in charge performing the track monitoring.
- Design specifications of the total station instrument to be used, including angular accuracy and distance measurement accuracy.
- Design specifications of the prisms or targets to be used. Include information on adhesives, if used.
- Plan views, cross sections, profile views, or diagrams showing the roadbed disturbing work and the relation to the Zones shown in Figure 1. Include soil boring logs and laboratory data related to the project site.
- Detailed plan showing control locations in relationship to the tracks, roadbed disturbing work, and zone of influence. Include details on methods and frequency of control verification.
- Detailed Track Monitoring Plan view showing the location of all RMP locations, control points to be occupied during monitoring, the ground disturbing work and the ZOI. Each RMP must be numbered, with the hundredth being the track number, even numbered points on right rail, odd numbered points on left rail in the direction of increasing milepost. See Figure 6 for an Example Track Monitoring Plan.

4.2. Contractor Safety Training

All contractors that work on Amtrak owned or leased property are required to complete Amtrak's Contractor Orientation Training available at: www.amtrakcontractor.com

Contractor identification badges must be worn / displayed on the outermost garment, above the waist, always while on Amtrak owned or leased property.

5. CONSTRUCTION

5.1. Track Inspector

Amtrak person having current qualifications in MW1000 and Physical Characteristics for the area work is being performed. Can inspect track and repair, restrict, or remove track form service if necessary.

Must be on-site when the leading end of work enters Zone 2 as shown on Figure 1 or as directed by the System Track COTR. Shall remain on-site until the completion of roadbed disturbing work, including reaming and pullback operations of horizontal directional drilling as defined by EP3005 Spec. 02082.

The Track Inspector will be provided at the sole cost of the project.

Will restrict or remove track form service if necessary, based on the MW1000 standards of track geometry for the class of track(s) involved. The Track Inspector has the authority to halt construction at any time should construction activities jeopardize the safe movement of trains over the work area.

5.2. Monitoring Procedures

Initial baseline reading of all monitoring points shall be recorded within ten (10) to five (5) days prior to construction. During the initial baseline readings, the offset from top of rail to the target shall be recorded for use in Track Monitoring Reports.

During construction, track monitoring shall start when the leading end of work enters Zone 2 as shown on Figure 2 or as directed by the System Track COTR. All RPMs shall be measured and recorded each time monitoring occurs.

Monitoring shall be performed at the beginning and end of every work shift, a minimum of twice daily (12-hour intervals). If track geometry meets or exceeds 0.03-feet (3/8-inch) of movement in any direction, monitoring must be performed every 4-hours until roadbed disturbing work is complete.

After roadbed disturbing work is complete, measurements will continue once a day until movement less than 0.01-feet (1/8-inch) has been observed for 5 consecutive days. Field conditions may warrant additional RMPs or extending the duration of post-construction monitoring as directed by the Track Inspector or System Track COTR.

5.3. Communication

Track Monitoring Report shall be produced immediately after each monitoring event. Measurements shown will be based on top-of-rail elevations based on the offset measured during initial setup. This will include total displacement of each RMP and cross level between RMP pairs.

Track Monitoring Reports must be signed and sealed by the surveyor in charge and cross-signed by the Track Inspector during work requiring their presence on-site. See Figure 6.7 for a sample Track Monitoring Report. The quickness of reporting track conditions is paramount to the safety of Amtrak operations.

An online sharing platform, such as Microsoft SharePoint Excel or Google Drive Sheets, must be set up and utilized by the contractor to immediately host the track monitoring data. A read-only link must be made available to the System Track COTR for distribution to Amtrak personnel as necessary. This real-time access will allow Amtrak's engineers to track movement and plan corrective action, if required.

5.4. Remediation Procedures for Track Movement

- As a reminder: any person MW1000 qualified can restrict or remove a track from service based on track geometry conditions. Any person can stop the work and trains should construction activities jeopardize the safe movement of trains over the work area.

Deficiencies in track surface and alignment caused by construction activities shall be corrected solely by Amtrak forces.

If track is measured to have met or exceeds the track geometry maintenance limits as defined in the MW1000 for the class of track concerned or moves 0.03-feet (3/8-inch) displacement from baseline in any direction, then all work shall cease immediately. The following two items must be undertaken:

- The Track Inspector must immediately inspect the track geometry and take any corrective action that may be required per MW1000.

- The contractor must immediately and continuously attempt to notify the Amtrak Construction Project Manager, Assistant Division Engineer of Track, and System Track COTR of the deviations and confirm that corrective action is being taken on-site.

It is assumed that subsidence will continue, and corrective actions should be taken before track geometry exceeds the safety limits set forth in MW1000.

Any repairs made to correct track geometry will be made at the sole cost of the contractor.

5.5. Construction Re-Start

Work may not resume until the track inspector has inspected all tracks within the limits of disturbance and completed any appropriate action to repair, restrict, or remove the tracks from service. In addition, one of the following requirements must be met:

- If no further subsidence is expected, the Construction Manager must inspect the site and taken corrective action to ensure continued construction actives will not cause further track issues to the satisfaction of the System Track COTR.

- If further subsidence is expected, the Construction Manager, Assistant Division Engineer, and System Track COTR should agree on how to best protect train operations. Any further actions required to ensure the safe passage of trains, such as increased frequency of track monitoring, shall be at the sole expense of the contractor.

6. FIGURES AND EXAMPLES

Figure 1, Zones of Influence under track (from Structures EP 3014)

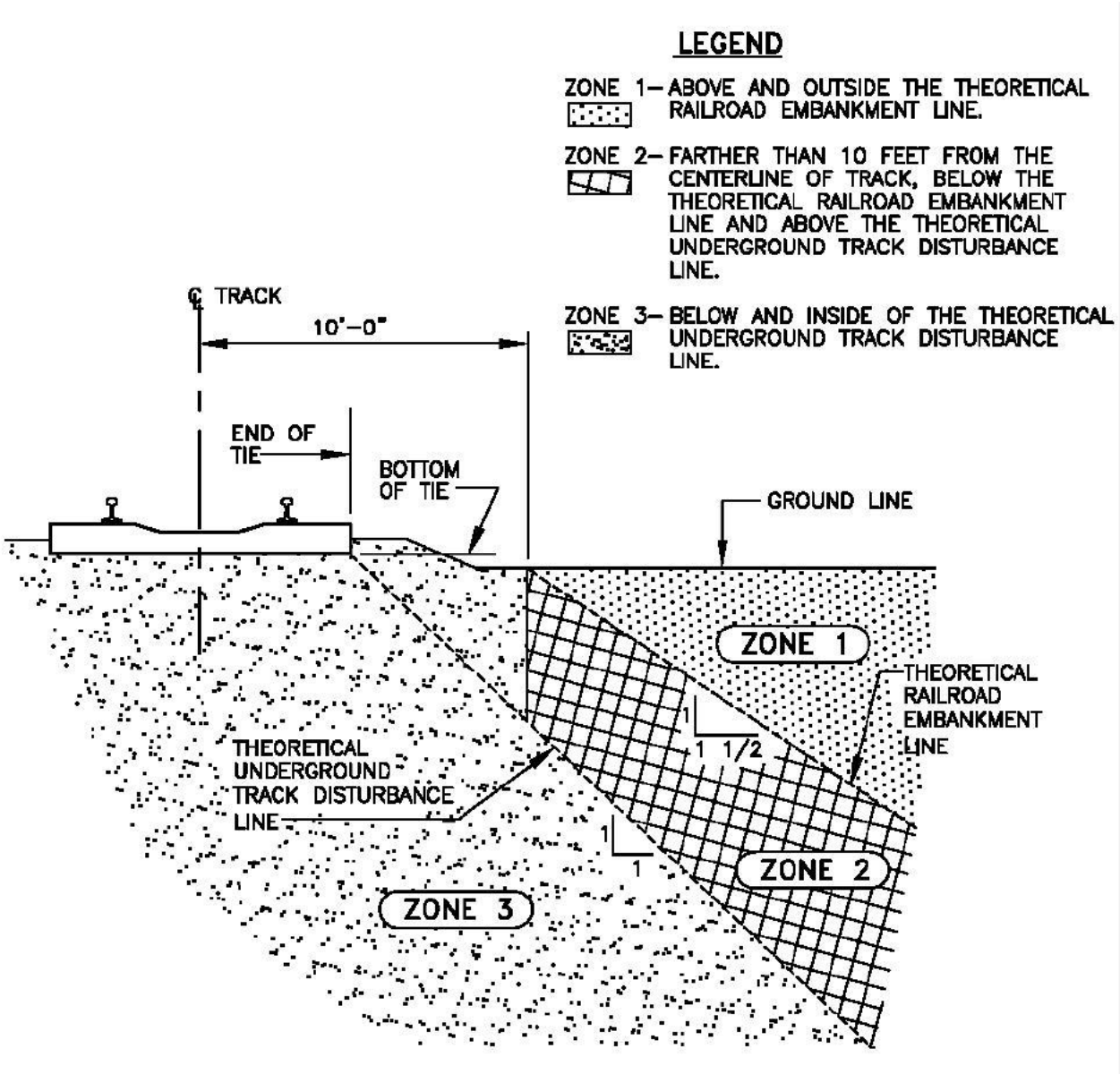


Figure 2, Section View of Underground Crossing

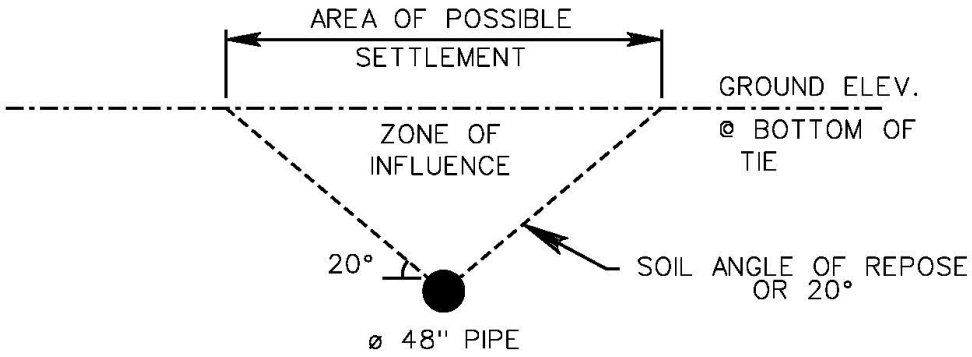
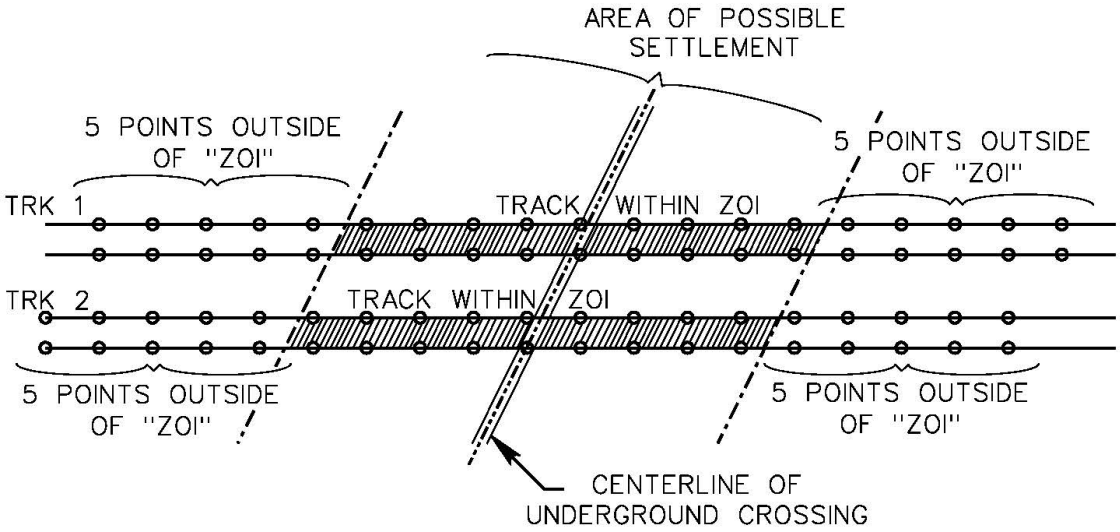


Figure 3, Plan View of Underground Crossing



TRACK MONITORING POINTS
SPACED 15.5 FEET ON BOTH RAILS

Figure 4, Section View of Parallel Work

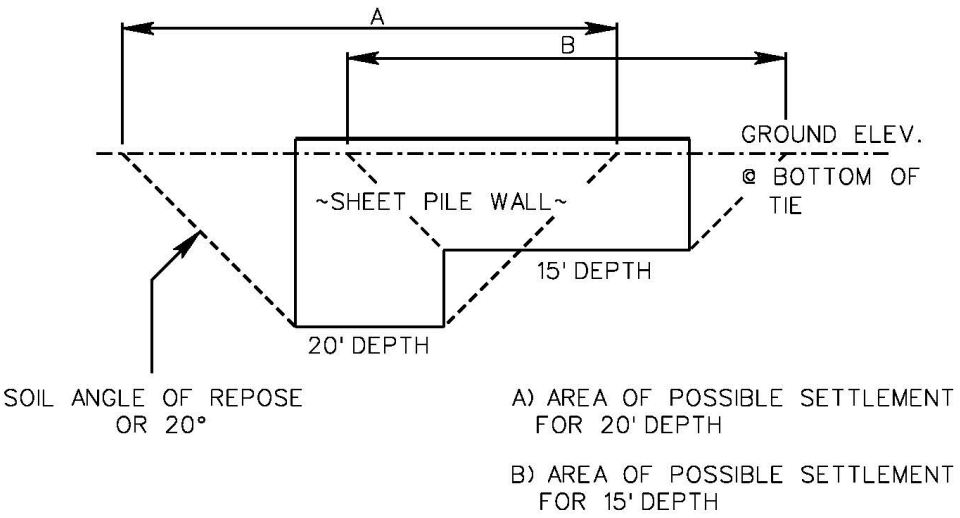


Figure 5, Plan View of Parallel Work

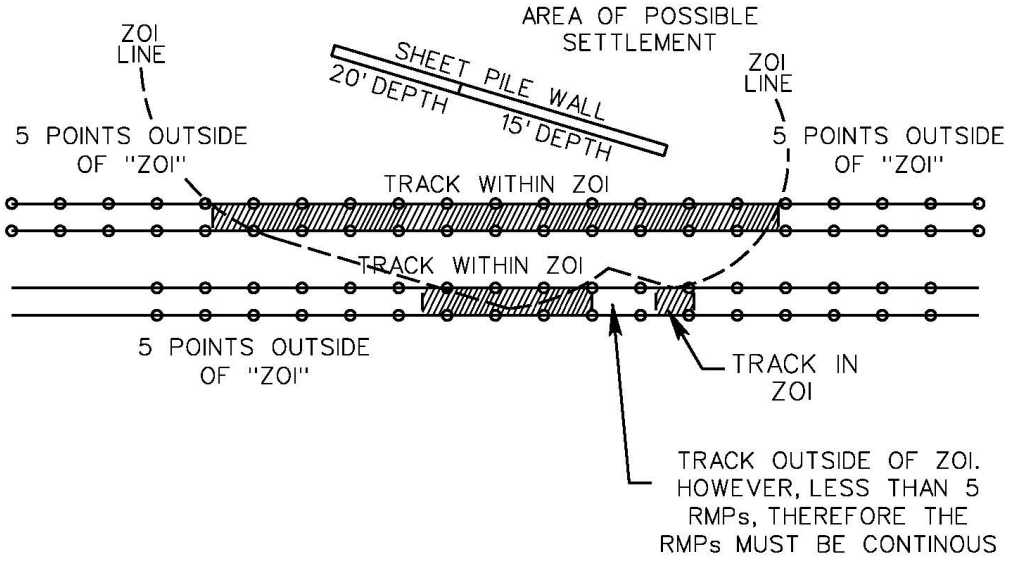


Figure 6, Example Track Monitoring Plan

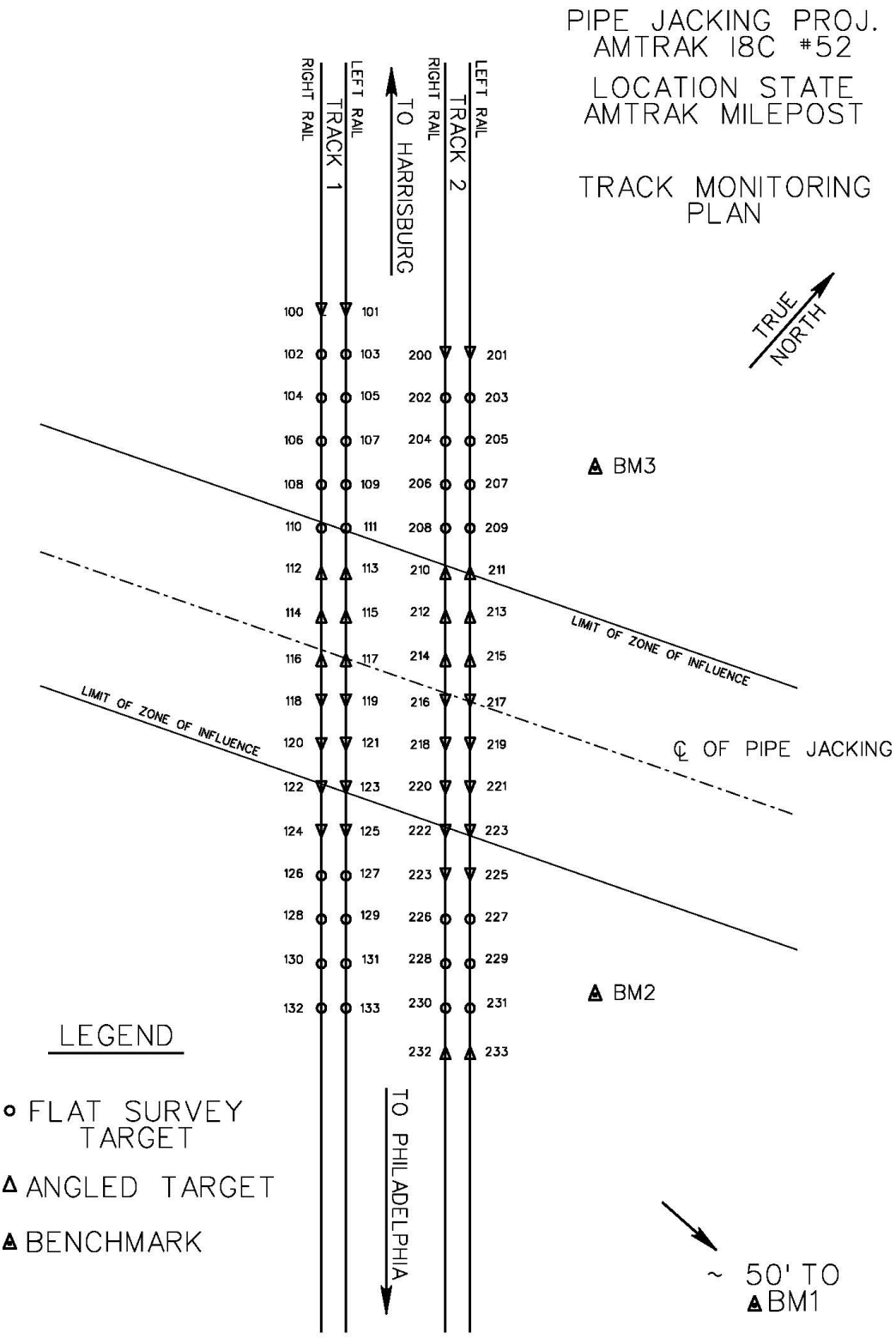


Figure 7, Example Track Monitoring Report

Monitoring Location: _____

Date & Time: _____

Underground Work Complete: _____ft

Track Number for this Sheet: _____

Right Rail				Left Rail				Cross Level (inches)
RPM	Top of Rail Movement (inches) (displacement from baseline)			RPM	Top of Rail Movement (inches) (displacement from baseline)			
	North	East	Elev		North	East	Elev	
100				101				
102				103				
104				105				
106				107				
108				109				
110				111				
112				113				
114				115				
116				117				
118				119				
120				121				
122				123				

Land Surveyor signature: _____ Seal:

Track Inspector signature: _____

Track Inspector SAP number: _____

Figure 8, Example Zone of Influence (Subsidence) Calculation

Scenario

Pipe jacking, perpendicular under tracks. 48-inch diameter pipe, 11-feet from top of rail elevation to top of pipe. No soil boring data given, assume Angle of Repose = 20°.

Calculations

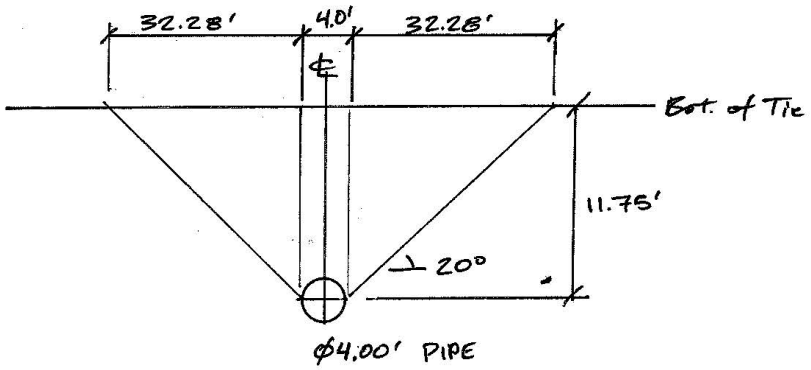
Pipe Work	⌀ 48-inch = 4.00 ft
Top of rail to bottom of tie	1.25 ft (typical)
Bottom of tie to center of pipe	depth top rail to top pipe – typical track depth + 1/2 Work
	11.00 ft – 1.25 ft + 2.00 ft = 7.75 ft
Half width of ZOI	[depth * tan (angle of repose)] + 1/2 Work
	[(11.75 ft) tan (90º - 20º)] + 2.00 ft = 34.28 ft

Convert ZOI to stations 34.28 ft / 15.5 ft = 2.216 -(round)-> 2 stations

Determine total RMP pairs on each track

Center station (1) + Stations in ZOI, each direction (2 + 2) + Five tie-in stations (5 + 5) = Total

Total pairs of RMPs = 15 (centered on crossing)



SCOPE AND NATURE

This practice provides procedures for Contractors to follow, when working on Amtrak Right-of-Way, adjacent to Amtrak tracks, to assure the protection of trains and maintenance of scheduled railroad operations.

SPECIAL REFERENCE

Note: This information was included under former Engineering Practice 1305.

Contractors shall comply with procedures detailed in the following specifications, when applicable:

Section	Title	Revision No.	Revision Date
01141A	Safety and Protection of Railroad Traffic and Property	4	10/01/12
01142A	Submission Documentation Required for Amtrak Review and Approval of Plans for Bridge Erection, Demolition and Other Crane/ Hoisting Operations over Railroad Right-of-Way	1	12/15/05
01520A	Requirements for Temporary Protection Shields for Demolition and Construction of Overhead Bridges and Other Structures	1	08/07/01
02261A	Requirements for Temporary Sheeting and Shoring to Support Amtrak Tracks	3	06/20/08

SPECIAL MATERIALS

Not Applicable

PROCEDURE

1. The Contractor shall conform to the applicable specifications.

2. Amtrak I&C shall assure that agencies and other third parties proposing construction on or adjacent to Amtrak Right-of-Way conform to Amtrak requirements detailed herein.

3. Amtrak Design and Construction shall review the Contractor’s proposed design and construction procedures for conformance with specifications, with sound engineering design practice and with the procedures detailed in the applicable Engineering Practice documents.

4. Amtrak Construction shall monitor the activities of the Contractor on-site to assure compliance/ adherence to approved procedures throughout the construction period.

REPORTING

As detailed in the specifications.

RESPONSIBILITY

Amtrak I&C Staff	Comply with Procedure
Director Project Initiation & Development	Assure Compliance
Amtrak Design Staff	Comply with Procedure
Director Structures Design	Assure Compliance
Amtrak Construction Staff	Comply with Procedure
Deputy Chief Engineer Construction	Assure compliance

SECTION 01141A – SAFETY AND PROTECTION OF RAILROAD TRAFFIC AND PROPERTY

PART 1 - GENERAL

1.1 SCOPE

A. This specification describes the safety procedures and protection provisions for Contractors and Permittees entering and working upon railroad property.

B. Use of this specification is as required by Amtrak, as described in Amtrak Engineering Practice EP3014.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.3 DEFINITIONS

A. CHIEF ENGINEER: Amtrak Chief Engineer

B. RAILROAD: National Railroad Passenger Corporation (Amtrak), and/or the duly authorized representative

C. ENGINEERING PRACTICE: Amtrak Engineering Practices establish a system of uniform practices, notices and instructions for the Amtrak Engineering Department, providing current, permanent and temporary, departmental procedures and policies.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PRE-ENTRY MEETING

A. Before entry of Permittee and/or Contractors onto Railroad's property, a pre-entry meeting shall be held at which time Permittee and/or Contractors shall submit for written approval of the Chief Engineer, plans, computations and a detailed description of proposed methods for accomplishing the work, including methods for protecting Railroad's traffic. Any such written approval shall not relieve Permittee and/or Contractor of their complete responsibility for the adequacy and safety of their operations.

3.2 RULES, REGULATIONS AND REQUIREMENTS

A. Railroad traffic shall be maintained at all times with safety and continuity, and Permittee and/or Contractors shall conduct their operations in compliance with all rules, regulations, and requirements of Railroad (including these Specifications) with respect to any work performed on, over, under, within or adjacent to Railroad's property. Permittee and/or Contractors shall be responsible for acquainting themselves with such rules, regulations and requirements. Any violation of Railroads safety rules, regulations, or requirements shall be grounds for the immediate suspension of the Permittee and/or Contractor work, and the re-training of all personnel, at the Permittee's expense.

3.3 MAINTENANCE OF SAFE CONDITIONS

A. If tracks or other property of Railroad are endangered during the work, Permittee and/or Contractor shall immediately take such steps as may be directed by Railroad to restore safe conditions, and upon failure of Permittee and/or Contractor to immediately carry out such direction, Railroad may take whatever steps are reasonably necessary to restore safe conditions. All costs and expenses of restoring safe conditions, and of repairing any damage to Railroad's trains, tracks, right-of-way or other property caused by the operations of Permittee and/or Contractors, shall be paid by Permittee.

3.4 PROTECTION IN GENERAL

A. Permittee and/or Contractors shall consult with the Chief Engineer to determine the type and extent of protection required to insure safety and continuity of railroad traffic. Any Inspectors, Track Foremen, Track Watchmen, Flagman, Signalmen, Electric Traction Linemen, or other employees deemed necessary by Railroad, at its sole discretion, for protective services shall be obtained from Railroad by Permittee and/or Contractors. The cost of same shall be paid directly to Railroad by Permittee. The provision of such employees by Railroad, and any other precautionary measures taken by Railroad, shall not relieve Permittee and/or Contractors from their complete responsibility for the adequacy and safety of their operations.

3.5 PROTECTION FOR WORK NEAR ELECTRIFIED TRACK OR WIRE

A. Whenever work is performed in the vicinity of electrified tracks and/or high voltage wires, particular care must be exercised, and Railroad's requirements regarding clearance to be maintained between equipment and tracks and/or energized wires, and otherwise regarding work in the vicinity of electrified tracks, must be strictly observed. No employees or equipment will be permitted to work near overhead wires, except when protected by a Class A employee of Railroad. **Permittee and/or Contractors must supply an adequate length of grounding cable (4/0 copper with approved clamps) for each piece of equipment working near or adjacent to any overhead wire**.

3.6 FOULING OF TRACK OR WIRE

A. No work will be permitted within twenty-five (25) feet of the centerline of track or the energized wire or have potential of getting within twenty-five (25) feet of track wire without the

approval of the Chief Engineer's representative. Permittee and/or Contractors shall conduct their work so that no part of any equipment or material shall foul an active track or overhead wire without the written permission of the Chief Engineer's representative. When Permittee and/or Contractors desire to foul an active track, they must provide the Chief Engineer's representative with their site-specific work plan a minimum of twenty-one (21) working days in advance, so that, if approved, arrangements may be made for proper protection of Railroad. Any equipment shall be considered to be fouling a track or overhead wire when located (a) within fifteen (15) feet from the centerline of the track or within fifteen (15) feet from the wire, or (b) in such a position that failure of same, with or without a load, would bring it within fifteen (15) feet from the centerline of the track or within fifteen (15) feet from the wire and requires the presence of the proper Railroad protection personnel.

B. If acceptable to the Chief Engineer's representative, a safety barrier (approved temporary fence or barricade) may be installed at fifteen (15) feet from centerline of track or overhead wire to afford the Permittee and/or Contractor with a work area that is not considered fouling. Nevertheless, protection personnel may be required at the discretion of the Chief Engineer's representative.

3.7 TRACK OUTAGES

A. Permittee and/or Contractors shall verify the time and schedule of track outages from Railroad before scheduling any of their work on, over, under, within, or adjacent to Railroad's right-of-way. Railroad does not guarantee the availability of any track outage at any particular time. Permittee and/or Contractors shall schedule all work to be performed in such a manner as not to interfere with Railroad operations. Permittee and/or Contractors shall use all necessary care and precaution to avoid accidents, delay or interference with Railroad's trains or other property.

3.8 DEMOLITION

A. During any demolition, the Contractor must provide horizontal and vertical shields, designed by a Professional Engineer registered in the state in which the work takes place. These shields shall be designed in accordance with the Railroad's specifications and approved by the Railroad, so as to prevent any debris from falling onto the Railroad's right-of-way or other property. A grounded temporary vertical protective barrier must be provided if an existing vertical protective barrier is removed during demolition. In addition, if any openings are left in an existing bridge deck, a protective fence must be erected at both ends of the bridge to prohibit unauthorized persons from entering onto the bridge.

B. Ballasted track structure shall be kept free of all construction and demolition debris. Geo-textiles or canvas shall be placed over the track ties and ballast to keep the ballast clean.

3.9 EQUIPMENT CONDITION

A. All equipment to be used in the vicinity of operating tracks shall be in "certified" first-class condition so as to prevent failures that might cause delay to trains or damage to Railroad's property. No equipment shall be placed or put into operation near or adjacent to operating tracks without first obtaining permission from the Chief Engineer's representative. **Under no**

circumstances shall any equipment or materials be placed or stored within twenty-five (25) feet from the centerline of an outside track, except as approved by the Site Specific Safety Work Plan. To insure compliance with this requirement, Permittee and/or Contractors **must establish a twenty-five (25) foot foul line prior to the start of work** by either driving stakes, taping off or erecting a temporary fence, or providing an alternate method as approved by the Chief Engineer's representative. Permittee and/or Contractors will be issued warning stickers which must be placed in the operating cabs of all equipment as a constant reminder of the twenty-five (25) foot clearance envelope.

3.10 STORAGE OF MATERIALS AND EQUIPMENT

A. No material or equipment shall be stored on Railroad's property without first having obtained permission from the Chief Engineer. Any such storage will be on the condition that Railroad will not be liable for loss of or damage to such materials or equipment from any cause.

B. If permission is granted for the storage of compressed gas cylinders on Railroad property, they shall be stored a minimum of 25 feet from the nearest track in an approved lockable enclosure. The enclosure shall be locked when the Permittee and/or Contractor is not on the project site.

3.11 CONDITION OF RAILROAD'S PROPERTY

A. Permittee and/or Contractors shall keep Railroad's property clear of all refuse and debris from its operations. Upon completion of the work, Permittee and/or Contractors shall remove from Railroad's property all machinery, equipment, surplus materials, falsework, rubbish, temporary structures, and other property of the Permittee and/or Contractors and shall leave Railroad's property in a condition satisfactory to the Chief Engineer.

3.12 SAFETY TRAINING

A. All individuals, including representatives and employees of Permittee and/or Contractor, before entering onto Railroad's property and before coming within twenty-five (25) feet of the centerline of the track or energized wire must first attend Railroad's Contractor Orientation Computer Based Training Class. The Contractor Orientation Class will be provided electronically at **www.amtrakcontractor.com**. Upon successful completion of the course and test, the individual taking the course will receive a temporary certificate without a photo that is valid for three weeks. The individual must upload a photo of himself/herself that will be embedded in the permanent ID card. The photo ID will be mailed to the individual's home address and must be worn/displayed while on Railroad property. Training is valid for one calendar year. All costs of complying with Railroad's safety training shall be at the sole expense of Permittee and/or Contractor. The Permittee and/or Contractor shall appoint a qualified person as its Safety Representative. The Safety Representative shall continuously ensure that all individuals comply with Railroad's safety requirements. All safety training records must be maintained with the Permittee's and/or Contractor's site specific work plan.

3.13 NO CHARGES TO RAILROAD

A. It is expressly understood that neither these Specifications, nor any document to which they are attached, include any work for which Railroad is to be billed by Permittee and/or Contractors, unless Railroad gives a written request that such work be performed at Railroad's expense.

END OF SECTION 01141A

SECTION 01142A – SUBMISSION DOCUMENTATION REQUIRED FOR AMTRAK REVIEW AND APPROVAL OF PLANS FOR BRIDGE ERECTION, DEMOLITION AND OTHER CRANE/ HOISTING OPERATIONS OVER RAILROAD RIGHT-OF-WAY

PART 1 - GENERAL

1.1 SCOPE

A. Amtrak requires that a site-specific work plan for accomplishing hoisting operations be prepared for every applicable project, and for each type of lift on a project.
   1. The plan shall demonstrate adherence to Amtrak safety rules.
   2. The plan shall demonstrate constructibility.
   3. The plan shall minimize impact to rail operations.
   4. The approved plan will provide the basis for field inspection/ verification of the actual work.

B. Preparation, review and approval of the Crane/ Hoisting site-specific work plan does not relieve the Contractor from meeting other Amtrak requirements for adequate planning and documentation of proposed work procedures within the Right-of-Way of the railroad..

C. Current Amtrak safety rules shall be adhered to in every respect.

D. Use of this specification is as required by Amtrak, as described in Amtrak Engineering Practice EP3014.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.3 DEFINITIONS

A. CHIEF ENGINEER: Amtrak Vice President, Chief Engineer

B. RAILROAD: National Railroad Passenger Corporation (Amtrak), and/or the duly authorized representative

C. ENGINEERING PRACTICE: Amtrak Engineering Practices establish a system of uniform practices, notices and instructions for the Amtrak Engineering Department, providing current, permanent and temporary, departmental procedures and policies.

1.4 SUBMISSION REQUIREMENTS

A. Unless otherwise directed in the Contract, the Contractor shall submit five sets of plans and calculations to the authorized representative of the Chief Engineer, Structures, whose name and address will be provided at the project pre-construction meeting.

B. Submitted calculations and plans shall be signed and sealed by a Professional Engineer, registered in the State in which the work will be performed.

C. The Contractor shall revise and resubmit plans and calculations as many times as necessary, until a complete and correct site-specific work plan for crane/ hoisting operations has been approved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 THE CONTRACTOR SHALL PROVIDE, AT A MINIMUM, THE FOLLOWING INFORMATION FOR REVIEW AND APPROVAL BY AMTRAK ENGINEERING STRUCTURES:

A. Plan view showing location(s) of cranes, operating radii, with delivery and/or disposal locations shown. Provide all necessary dimensions for locating the elements of the plan.

B. Plans and computations showing the weight of the pick.

C. Crane rating sheets, demonstrating that cranes are adequate for 150% of the calculated pick weight. That is, the cranes shall be capable of picking 150% of the load, while maintaining normal, recommended factors of safety. The adequacy of the crane for the proposed pick shall be determined by using the manufacturer's published crane rating chart and not the maximum crane capacity. Crane and boom nomenclature is to be indicated.

D. Calculations demonstrating that slings, shackles, lifting beams, etc. are adequate for 150% of the calculated pick weight.

E. Location plan showing obstructions, indicating that the proposed swing is possible. "Walking" of load using two cranes will not be permitted. Rather, multiple picks and repositioning of the crane may be permitted to get the load to the needed location for the final pick, if necessary.

F. Data sheet listing types and sizes of slings and other connecting equipment. Include copies of catalog cuts for specialized equipment. Detail attachment methods on the plans.

G. A complete procedure, indicating the order of lifts and any repositioning or re-hitching of the crane or cranes.

H. Temporary support of any components or intermediate stages, as may be required.

I. A time schedule of the various stages, as well as a schedule for the entire lifting process.

END OF SECTION 01142A

SECTION 01520A – REQUIREMENTS FOR TEMPORARY PROTECTION SHIELDS FOR DEMOLITION AND CONSTRUCTION OF OVERHEAD BRIDGES AND OTHER STRUCTURES

PART 1 - GENERAL

1.1 SCOPE

A. This engineering practice describes items to be included in the design and construction of temporary protection shields for construction overhead and near to Amtrak tracks.

B. Use of this specification is as required by Amtrak, as described in Amtrak Engineering Practice EP3014.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.3 DEFINITIONS

A. CHIEF ENGINEER: Amtrak Vice President, Chief Engineer

B. RAILROAD: National Railroad Passenger Corporation (Amtrak), and/or the duly authorized representative

C. ENGINEERING PRACTICE: Amtrak Engineering Practices establish a system of uniform practices, notices and instructions for the Amtrak Engineering Department, providing current, permanent and temporary, departmental procedures and policies.

1.4 SUBMISSION REQUIREMENTS

A. Unless otherwise directed in the Contract, the Contractor shall submit five sets of plans and calculations to the authorized representative of the Chief Engineer, Structures, whose name and address will be provided at the project pre-construction meeting.

B. Submitted calculations and plans shall be signed and sealed by a Professional Engineer, registered in the State in which the work will be performed.

C. The Contractor shall revise and resubmit plans and calculations as many times as necessary, until a complete and correct site-specific work plan for crane/ hoisting operations has been approved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CONTRACTORS WORKING ON OVERHEAD OR NEARBY DEMOLITION AND/OR CONSTRUCTION ADJACENT TO AMTRAK TRACKS, SHALL CONFORM TO THE FOLLOWING

DESIGN AND CONSTRUCTION REQUIREMENTS FOR TEMPORARY PROTECTION SHIELDING:

A. The Contractor shall maintain a specified level of protection to railroad facilities, during demolition and construction activities that occur overhead and nearby Amtrak tracks, as shown on the Contract Plans, as detailed in the Contract Specifications, and as described below.

B. Prior to the start of construction, the Contractor shall submit to Amtrak for review and approval, detailed, site specific plans for temporary protection shields. The plans will be reviewed as to the methods of erection, and as to whether or not the proposed installation will provide the required level of protection. No construction shall proceed until the Contractor has received written approval of the Contractor's complete, site specific plans, from Amtrak.

C. The Contractor shall design the protection shields to conform to all applicable and governing federal, state and local laws and regulations.

D. Drawings for the proposed temporary protection shields shall be signed and sealed by a Licensed Professional Engineer. Complete design calculations, clearly referenced to the drawings, and easy to review, shall be provided with submission of drawings.

E. Protection shields shall be designed for the following, minimum load and size criteria.
   1. The horizontal shield design liveload on horizontal surfaces shall be the greater of a minimum of 100 pounds per square foot (psf) [5000 Pascals] or the anticipated liveload to be produced by the Contractor's anticipated operations. When determining the appropriate design live load, the designer shall consider factors such as the physical capacity of proposed debris-catching platforms to retain materials, and the type of equipment the platforms might support. Positive means of demolition and construction controls shall be provided to assure that debris that may collect on the shield will not exceed the design live load. The horizontal protection shield, in plan view, shall cover no less than the area directly over the tracks plus ten feet minimum beyond the centerline of the outermost tracks.
   2. The vertical shield shall be designed to carry a minimum 30 psf [1500 Pascals] allowance for wind load. The vertical shield shall extend a minimum of 6'-6" [1950 millimeters] above the top of the adjacent surface, such as curb or sidewalk. Anti-climb wings shall be installed at each end, as necessary, to restrict access to the railroad property.

F. The vertical and horizontal clearance envelopes required for maintenance of railroad operations, shall be indicated on the site specific work plans. These clearances are subject to review and approval by Amtrak. If applicable, both temporary and permanent envelopes shall be indicated on the plans. The temporary protection shields shall be installed outside the limits of these minimum vertical and horizontal clearances shown on the site specific work plans.

G. In electrified territory, temporary protection shields shall be bonded and grounded.

H. Temporary protection shields shall be designed and constructed to prevent dust, debris, concrete, formwork, paint, tools, or anything else from falling onto the railroad property below.

I. The temporary protection shields shall be attached to the structure in accordance with site specific work plans submitted by the Contractor and approved by Amtrak. Drilling in structural members and welding will generally not be permitted in members that are scheduled to remain in place in the reconstructed structure. For existing members scheduled for demolition or for later reconstruction, any proposed attachment shall be designed with consideration of potential existing, deteriorated conditions.

J. The Contractor shall provide the Amtrak on-site representative, for review and approval prior to any construction activity in the effected area, a proposed construction schedule for the installation, maintenance and removal of the temporary protection shields.

K. The temporary protection shields shall be installed prior to the start of any other work over the railroad in the effected areas. No construction shall proceed until the Amtrak on-site representative reviews and approves the Contractor's installed protection. Before proceeding with the work, Amtrak must be satisfied, in its sole judgment, that sufficient protection has been provided to proceed with the work.

L. The Contractor shall install and remove temporary protection shields only when an Amtrak representative is on-site.

M. The Contractor shall not install or remove temporary protection shields during train operations.

N. Temporary protection shields shall remain in place for the duration of construction activities over and nearby the railroad in the effected areas. The Contractor may remove temporary construction only after approved by Amtrak on-site representatives.

O. Where site specific conditions impose insurmountable restrictions to the design of temporary construction conforming to the limitations listed above, the design of temporary construction shall be developed in close coordination with Amtrak design review personnel. The Chief Engineer, Structures shall provide final approval of temporary construction that does not conform to the above limitations.

END OF SECTION 01520A

SECTION 02261A – REQUIREMENTS FOR TEMPORARY SHEETING AND SHORING TO SUPPORT AMTRAK TRACKS

PART 1 - GENERAL

1.1 SCOPE

A. This engineering practice describes items to be included in the design and construction of temporary sheeting and shoring construction adjacent and proximate to Amtrak tracks.

B. Use of this specification is as required by Amtrak, as described in Amtrak Engineering Practice EP3014.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.3 DEFINITIONS

A. CHIEF ENGINEER: Amtrak Vice President, Chief Engineer

B. RAILROAD: National Railroad Passenger Corporation (Amtrak), and/or the duly authorized representative

C. ENGINEERING PRACTICE: Amtrak Engineering Practices establish a system of uniform practices, notices and instructions for the Amtrak Engineering Department, providing current, permanent and temporary, departmental procedures and policies.

1.4 SUBMISSION REQUIREMENTS

A. Unless otherwise directed in the Contract, the Contractor shall submit five sets of plans and calculations to the authorized representative of the Chief Engineer, Structures, whose name and address will be provided at the project pre-construction meeting.

B. Submitted calculations and plans shall be signed and sealed by a Professional Engineer, registered in the State in which the work will be performed.

C. The Contractor shall revise and resubmit plans and calculations as many times as necessary, until a complete and correct site-specific work plan for temporary sheeting and shoring has been approved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CONTRACTORS INSTALLING TEMPORARY CONSTRUCTION SHEETING AND SHORING TO SUPPORT AMTRAK TRACKS SHALL CONFORM TO THE FOLLOWING:

A. Footings for all piers, columns, walls, or other facilities shall be located and designed so that any temporary sheeting and shoring for support of adjacent track or tracks during construction, will not be closer than toe of ballast slope. The dimension from gage of rail to toe of ballast, along tangent track, is 7'-5"; see dimensions on Track standard plans for curved track dimensions.

B. USE OF SHEETING: When support of track or tracks is necessary during construction of the above-mentioned facilities, interlocking steel sheeting, adequately braced and designed to carry Cooper E80 live-load plus 50 percent impact allowance is required. Soldier piles and lagging will be permitted for track support ONLY when required penetration of steel sheet piling cannot be obtained, due to site-specific conditions that make steel sheet piling placement impracticable, in the opinion of the authorized, Amtrak design review engineer.
   1. For usual soil conditions and limited excavations, sheeting is required when the near-track excavation extends beneath or nearer to the track than the Theoretical Railroad Embankment Line. The Theoretical Railroad Embankment Line is defined as a line that starts at grade, ten foot from the centerline of the outer track, and extends downward, away from the track, at a slope of 1-1/2 horizontal to one vertical.
   2. For special soil conditions, such as soft organic soils and rock conditions, and for unusual excavation conditions, temporary supports for excavations may be necessary even when the limits fall beyond the Theoretical Railroad Embankment Line, requiring site specific analysis by a professional, geotechnical engineer.
   3. See Sketch SK-1, "Normal Requirements for Sheet Piling Adjacent to Tracks".

C. Exploratory trenches, three feet deep and 15 inches wide in the form of an "H", with outside dimensions matching the proposed outside dimensions of sheeting, shall be hand dug, prior to placing and driving the sheeting, in any area where railroad or utility underground installations are known or suspected. These trenches are for exploratory purposes only, and shall be backfilled and immediately compacted, in layers. This work shall be performed only in the presence of a railroad inspector.

D. Absolute use of track is required while driving sheeting adjacent to running track. Track usage shall be prearranged per standard procedures, through the Amtrak project representative.

E. Cavities adjacent to sheet piling, created by pile driving, shall be filled with sand, and any disturbed ballast shall be restored and tamped immediately.

F. Sheet piling cutoffs
   1. During construction, sheeting shall be cut off at an elevation no higher than the top of tie.
   2. At the completion of construction activities involving the use of sheet piling, sheet piling may be pulled if there will be no adverse impact to the railroad track support bed, as determined by the Amtrak site engineer. This will generally be permitted when both of these conditions are met:
      a. the sheeting face is at least ten feet distant from the centerline of track, and
      b. the bottom of the excavation that the sheeting supported prior to backfilling, does not fall within an assumed influence zone under the tracks. The assumed influence

zone is defined as the area, as seen in cross-sectional view, falling beneath the Theoretical Underground Track Disturbance Line. This line is defined as a line that starts at the end and bottom of the ties, and extends from the track outward and downward at a one-to-one (45-degree) slope.

3. Sheet piling that is to be left in-place, shall be cut off below the ground line
   a. at least eighteen inches below final ground line at the sheeting, and
   b. no higher than 24 inches below the elevation of the bottom of the nearest ties
4. See Sketch SK-1, "Normal Requirements for Sheet Piling Adjacent to Tracks".

G. The excavation adjacent to the track shall be covered, ramped and protected by handrails, barricades and warning lights, as required by applicable safety regulations, and as directed by Amtrak.

H. Final backfilling of excavation shall conform to project specifications.

I. The Contractor shall provide Amtrak with a detailed schedule of proposed construction operations, detailing each step of the proposed temporary construction operations in proximity to Amtrak tracks, so that Amtrak may review and approve the proposed operations, and may properly inspect and monitor operations.

J. Drawings for the proposed temporary sheeting and shoring shall be signed and sealed by a Licensed Professional Engineer. Complete design calculations, clearly referenced to the drawings, and easy to review, shall be provided with submission of drawings.

K. Where site specific conditions impose insurmountable restrictions to the design of temporary construction conforming to the limitations listed above, the design of temporary construction shall be developed in close coordination with Amtrak design review personnel. The Chief Engineer, Structures shall provide final approval of temporary construction that does not conform to the above limitations.

1. When Amtrak grants approval for sheeting closer than standard minimum clearances, the Contractor shall develop a survey plan, if not already required by the project, for the adjacent tracks, to be conducted prior to, during, and after the temporary sheeting construction operations. If settlement is detected, construction operations shall be suspended until the track has been returned to its initial condition, and stabilized, as determined by the Amtrak project site representative.
2. The Contractor shall stockpile ten (10) tons of approved ballast at the project site, and maintain that amount in ready reserve, to allow for the possible need to restore track profile.

L. Particular care shall be taken in the planning, design and execution of temporary construction, as relates to railroad slope protection and drainage facilities. Erosion and sediment control best management practices shall be designed and employed, as approved by Amtrak. Any unintended disruption to railroad drainage facilities, caused by the temporary construction, shall be promptly remedied, as directed by the Engineer, solely at the Contractor's cost.

M. The following Information Sketch is attached:

1. Figure No. SK-1: Normal Requirements for Sheet Piling Adjacent to Track

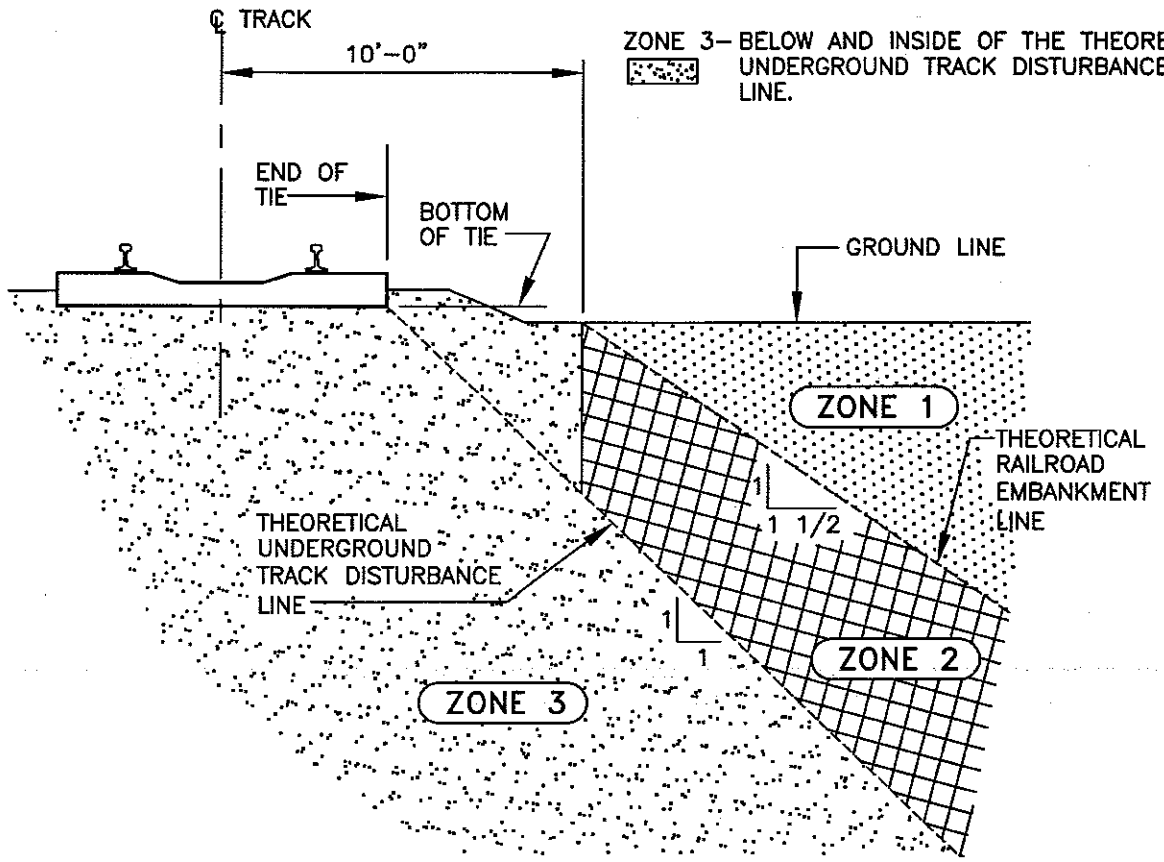
END OF SECTION 02261A

LEGEND

ZONE 1 – ABOVE AND OUTSIDE THE THEORETICAL RAILROAD EMBANKMENT LINE.

ZONE 2 – FARTHER THAN 10 FEET FROM THE CENTERLINE OF TRACK, BELOW THE THEORETICAL RAILROAD EMBANKMENT LINE AND ABOVE THE THEORETICAL UNDERGROUND TRACK DISTURBANCE LINE.

ZONE 3 – BELOW AND INSIDE OF THE THEORETICAL UNDERGROUND TRACK DISTURBANCE LINE.



NORMAL REQUIREMENTS FOR SHEET PILING ADJACENT TO TRACK

(1) EXCAVATIONS WITHIN ZONE 1 – ABOVE AND OUTSIDE OF THE THEORETICAL RAILROAD EMBANKMENT LINE – DO NOT NORMALLY REQUIRE SHEETING TO PROTECT RAILROAD ROAD BED. SHEETING MAY BE REQUIRED FOR OTHER REASONS.

(2) EXCAVATIONS WHOSE BOTTOMS EXTEND INTO ZONE 2 REQUIRE SHEETING, BUT THE SHEETING MAY NORMALLY BE PULLED AFTER THE EXCAVATION HAS BEEN BACKFILLED.

(3) EXCAVATIONS WHOSE BOTTOMS EXTEND INTO ZONE 3 WILL NORMALLY REQUIRE THE SHEETING TO BE LEFT IN PLACE AND CUT–OFF PER REQUIREMENTS.

Office of Chief Engineer
STRUCTURES
National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

SKETCH 1

SPEC. 02261A – REV. 1

Designed	Drawn	Date
CJR	JLM	8/06/01

File No:	
Design No:	3501
Sheet No.	1 of 1
Dwg. No.	SK–1

SCOPE AND NATURE

There are many areas along the railroad corridor that are receiving storm water from adjacent property that results in flooding during the smallest of storms. Increased storm water flow to the railroad property increases deposits of excessive amounts of sedimentation and could cause fouling of the track structure. With the introduction of the High Speed Rail Trains, passenger safety is of the utmost importance. Diminished track support from flooding and sedimentation will not be allowed.

It is Amtrak's policy to limit the resultant discharge and drainage of storm water from the development of adjacent properties to no more than pre-existing conditions, as demonstrated by engineering analyses through governmental regulatory processes.

It is Amtrak's policy to protect the railroad right-of-way from sediment, erosion and excess runoff during all stages of construction activities on adjacent properties, as demonstrated by engineering analyses through governmental regulatory processes.

SPECIAL REFERENCE

The following policy is to augment Specification 02861 of EP3005, Pipeline Occupancy Requirements and Specifications, and other Amtrak I&C, design and construction standards.

SPECIAL MATERIALS

N/A

PROCEDURE

The discharge of storm water onto railroad property will be prohibited for all construction projects on or adjacent to Railroad property, unless the applicant can demonstrate that there will be a "zero net runoff" result in the peak flow and total volume based on a 100 Year Storm event, and that receiving waters downstream will not be impacted.

Computations indicating this design and suitable topographic plans, prepared by a Professional Engineer, licensed in the state in which the work will be performed, shall be submitted to the Chief Engineer for approval at least 60 days in advance of construction. If the drainage is to discharge into an existing drainage channel on or under the Railroad Right of Way, a hydraulic analysis of the existing structures must be included.

Formal approval of the proposed design, by the appropriate governmental agency or agencies, must be submitted with the computations. Control of soil erosion and sedimentation must be demonstrated on the design plans in accordance with the appropriate state and local regulations.

The Contractor shall be responsible for control of the site and protection of railroad property during the entire construction project, through completion. The design of sedimentation, erosion and runoff control during construction shall accommodate conditions of every phase of construction.

Review, monitoring and approval process:

1. The Contractor shall conform to this Amtrak policy, and demonstrate conformance by standard Amtrak review submissions and approvals, as noted above.

2. Amtrak I&C shall assure that agencies and other third parties proposing construction on or adjacent to Amtrak Right-of-Way conform to Amtrak policy detailed herein.

3. Amtrak Design and Construction shall review the Contractor's proposed design and construction procedures for conformance with Amtrak policy, as demonstrated through appropriate engineering analyses and the government regulatory process.

4. Amtrak Construction shall monitor the activities of the Contractor on-site to assure compliance/ adherence to approved procedures throughout the construction period.

REPORTING

N/A

RESPONSIBILITY

Amtrak I&C Staff	Comply with Procedure
Director I&C	Assure Compliance
Amtrak Design Staff	Comply with Procedure
Director Structures Design	Assure Compliance
Amtrak Construction Staff	Comply with Procedure
Sr. Director Construction	Assure compliance

APPENDIX

ATTACHMENT B
GENERAL DECLARATIONS

City of Ann Arbor
Guy C. Larcom Municipal Building
Ann Arbor, Michigan 48107

Ladies and Gentlemen:

The undersigned, as Bidder, declares that this Bid is made in good faith, without fraud or collusion with any person or persons bidding on the same Contract; that this Bidder has carefully read and examined the bid documents, including City Nondiscrimination requirements and Declaration of Compliance Form, Living Wage requirements and Declaration of Compliance Form, Prevailing Wage requirements and Declaration of Compliance Form, Vendor Conflict of Interest Form, Notice of Pre-Bid Conference, General Information, Bid, Bid Forms, Contract, Bond Forms, General Conditions, Standard Specifications, Detailed Specifications, all Addenda, and the Plans (if applicable) and understands them. The Bidder declares that it conducted a full investigation at the site and of the work proposed and is fully informed as to the nature of the work and the conditions relating to the work's performance. The Bidder also declares that it has extensive experience in successfully completing projects similar to this one.

The Bidder acknowledges that it has not received or relied upon any representations or warrants of any nature whatsoever from the City of Ann Arbor, its agents or employees, and that this Bid is based solely upon the Bidder's own independent business judgment.

The undersigned proposes to perform all work shown on the plans or described in the bid documents, including any addenda issued, and to furnish all necessary machinery, tools, apparatus, and other means of construction to do all the work, furnish all the materials, and complete the work in strict accordance with all terms of the Contract of which this Bid is one part.

In accordance with these bid documents, and Addenda numbered _____, the undersigned, as Bidder, proposes to perform at the sites in and/or around Ann Arbor, Michigan, all the work included herein for the amounts set forth in the Bid Forms.

The Bidder declares that it has become fully familiar with the liquidated damage clauses for completion times and for compliance with City Code Chapter 112, understands and agrees that the liquidated damages are for the non-quantifiable aspects of non-compliance and do not cover actual damages that may be shown and agrees that if awarded the Contract, all liquidated damage clauses form part of the Contract.

The Bidder declares that it has become fully familiar with the provisions of Chapter 14, Section 1:320 (Prevailing wages) and Chapter 23 (Living Wage) of the Code of the City of Ann Arbor and that it understands and agrees to comply, to the extent applicable to employees providing services to the City under this Contract, with the wage and reporting requirements stated in the City Code provisions cited. Bidder certifies that the statements contained in the City Prevailing Wage and Living Wage Declaration of Compliance Forms are true and correct. Bidder further agrees that the cited provisions of Chapter 14 and Chapter 23 form a part of this Contract.

The Bidder declares that it has become familiar with the City Conflict of Interest Disclosure Form and certifies that the statement contained therein is true and correct.

The Bidder encloses a certified check or Bid Bond in the amount of 5% of the total of the Bid Price. The Bidder agrees both to contract for the work and to furnish the necessary Bonds and insurance documentation within 10 days after being notified of the acceptance of the Bid.

If this Bid is accepted by the City and the Bidder fails to contract and furnish the required Bonds and insurance documentation within 10 days after being notified of the acceptance of this Bid, then the Bidder shall be considered to have abandoned the Contract and the certified check or Bid Bond accompanying this Bid shall become due and payable to the City.

If the Bidder enters into the Contract in accordance with this Bid, or if this Bid is rejected, then the accompanying check or Bid Bond shall be returned to the Bidder.

In submitting this Bid, it is understood that the right is reserved by the City to accept any Bid, to reject any or all Bids, to waive irregularities and/or informalities in any Bid, and to make the award in any manner the City believes to be in its best interest.

SIGNED THIS _____ DAY OF _____, 202_.

_____	_____
Bidder's Name	Authorized Signature of Bidder
_____	_____
Official Address	(Print Name of Signer Above)
_____	_____
Telephone Number	Email Address for Award Notice

ATTACHMENT C
LEGAL STATUS OF BIDDER

(The bidder shall fill out the appropriate form and strike out the other three.)

Bidder declares that it is:

* A corporation organized and doing business under the laws of the State of _____, for whom _____, bearing the office title of _____, whose signature is affixed to this Bid, is authorized to execute contracts.

NOTE: If not incorporated in Michigan, please attach the corporation's Certificate of Authority

• A limited liability company doing business under the laws of the State of _____, whom _____ bearing the title of _____ whose signature is affixed to this proposal, is authorized to execute contract on behalf of the LLC.

* A partnership, organized under the laws of the state of _____ and filed in the county of _____, whose members are (list all members and the street and mailing address of each) (attach separate sheet if necessary):

_____

_____

_____

_____

_____

* An individual, whose signature with address, is affixed to this Bid: __ _____
(initial here)

Authorized Official

_____ **Date** _____**,** 202_

(Print) Name _____ Title _____

Company:

_____

Address:

_____

Contact Phone ( ) _____ Fax ( ) _____

Email _____

ATTACHMENT D
PREVAILING WAGE DECLARATION OF COMPLIANCE

The "wage and employment requirements" of Section 1:320 of Chapter 14 of Title I of the Ann Arbor City Code mandates that the city not enter any contract, understanding or other arrangement for a public improvement for or on behalf of the city unless the contract provides that all craftsmen, mechanics and laborers employed directly on the site in connection with said improvements, including said employees of subcontractors, shall receive the prevailing wage for the corresponding classes of craftsmen, mechanics and laborers, as determined by statistics for the Ann Arbor area compiled by the United States Department of Labor. Where the contract and the Ann Arbor City Code are silent as to definitions of terms required in determining contract compliance with regard to prevailing wages, the definitions provided in the Davis-Bacon Act as amended (40 U.S.C. 278-a to 276-a-7) for the terms shall be used. Further, to the extent that any employees of the contractor providing services under this contract are not part of the class of craftsmen, mechanics and laborers who receive a prevailing wage in conformance with section 1:320 of Chapter 14 of Title I of the Code of the City of Ann Arbor, employees shall be paid a prescribed minimum level of compensation (i.e. Living Wage) for the time those employees perform work on the contract in conformance with section 1:815 of Chapter 23 of Title I of the Code of the City of Ann Arbor.

At the request of the city, any contractor or subcontractor shall provide satisfactory proof of compliance with this provision.

The Contractor agrees:

(a) To pay each of its employees whose wage level is required to comply with federal, state or local prevailing wage law, for work covered or funded by this contract with the City,

(b) To require each subcontractor performing work covered or funded by this contract with the City to pay each of its employees the applicable prescribed wage level under the conditions stated in subsection (a) or (b) above.

(c) To provide to the City payroll records or other documentation within ten (10) business days from the receipt of a request by the City.

(d) To permit access to work sites to City representatives for the purposes of monitoring compliance, and investigating complaints or non-compliance.

The undersigned states that he/she has the requisite authority to act on behalf of his/her employer in these matters and has offered to provide the services in accordance with the terms of the wage and employment provisions of the Chapter 14 of the Ann Arbor City Code. The undersigned certifies that he/she has read and is familiar with the terms of Section 1:320 of Chapter 14 of the Ann Arbor City Code and by executing this Declaration of Compliance obligates his/her employer and any subcontractor employed by it to perform work on the contract to the wage and employment requirements stated herein. The undersigned further acknowledges and agrees that if it is found to be in violation of the wage and employment requirements of Section 1:320 of the Chapter 14 of the Ann Arbor City Code it shall has be deemed a material breach of the terms of the contract and grounds for termination of same by the City.

_____
Company Name

_____
Signature of Authorized Representative Date

_____
Print Name and Title

_____
Address, City, State, Zip

_____
Phone/Email address

Questions about this form? Contact Procurement Office City of Ann Arbor Phone: 734/794-6500

ATTACHMENT E
LIVING WAGE ORDINANCE DECLARATION OF COMPLIANCE

The Ann Arbor Living Wage Ordinance (Section 1:811-1:821 of Chapter 23 of Title I of the Code) requires that an employer who is (a) a contractor providing services to or for the City for a value greater than $10,000 for any twelve-month contract term, or (b) a recipient of federal, state, or local grant funding administered by the City for a value greater than $10,000, or (c) a recipient of financial assistance awarded by the City for a value greater than $10,000, shall pay its employees a prescribed minimum level of compensation (i.e., Living Wage) for the time those employees perform work on the contract or in connection with the grant or financial assistance. The Living Wage must be paid to these employees for the length of the contract/program.

Companies employing fewer than 5 persons and non-profits employing fewer than 10 persons are exempt from compliance with the Living Wage Ordinance. If this exemption applies to your company/non-profit agency please check here [___] *No. of employees__*

The Contractor or Grantee agrees:

(a) To pay each of its employees whose wage level is not required to comply with federal, state or local prevailing wage law, for work covered or funded by a contract with or grant from the City, no less than the Living Wage. The current Living Wage is defined as $15.90/hour for those employers that provide employee health care (as defined in the Ordinance at Section 1:815 Sec. 1 (a)), or no less than $17.73/hour for those employers that do not provide health care. The Contractor or Grantor understands that the Living Wage is adjusted and established annually on April 30 in accordance with the Ordinance and covered employers shall be required to pay the adjusted amount thereafter to be in compliance with Section 1:815(3).

Check the applicable box below which applies to your workforce

[___] Employees who are assigned to any covered City contract/grant will be paid at or above the applicable living wage without health benefits

[___] Employees who are assigned to any covered City contract/grant will be paid at or above the applicable living wage with health benefits

(b) To post a notice approved by the City regarding the applicability of the Living Wage Ordinance in every work place or other location in which employees or other persons contracting for employment are working.

(c) To provide to the City payroll records or other documentation within ten (10) business days from the receipt of a request by the City.

(d) To permit access to work sites to City representatives for the purposes of monitoring compliance, and investigating complaints or non-compliance.

(e) To take no action that would reduce the compensation, wages, fringe benefits, or leave available to any employee covered by the Living Wage Ordinance or any person contracted for employment and covered by the Living Wage Ordinance in order to pay the living wage required by the Living Wage Ordinance.

The undersigned states that he/she has the requisite authority to act on behalf of his/her employer in these matters and has offered to provide the services or agrees to accept financial assistance in accordance with the terms of the Living Wage Ordinance. The undersigned certifies that he/she has read and is familiar with the terms of the Living Wage Ordinance, obligates the Employer/Grantee to those terms and acknowledges that if his/her employer is found to be in violation of Ordinance it may be subject to civil penalties and termination of the awarded contract or grant of financial assistance.

_____	_____
Company Name	Street Address
_____	_____
Signature of Authorized Representative Date	City, State, Zip
_____	_____
Print Name and Title	Phone/Email address

Attachment F

CITY OF ANN ARBOR
LIVING WAGE ORDINANCE

RATE EFFECTIVE APRIL 30, 2023 - ENDING APRIL 29, 2024

$15.90 per hour
If the employer provides health care benefits*

$17.73 per hour
If the employer does **NOT** provide health care benefits*

Employers providing services to or for the City of Ann Arbor or recipients of grants or financial assistance from the City of Ann Arbor for a value of more than $10,000 in a twelve-month period of time must pay those employees performing work on a City of Ann Arbor contract or grant, the above living wage.

V.

W. ENFORCEMENT

X. The City of Ann Arbor may recover back wages either administratively or through court action for the employees that have been underpaid in violation of the law. Persons denied payment of the living wage have the right to bring a civil action for damages in addition to any action taken by the City.

Violation of this Ordinance is punishable by fines of not more than $500/violation plus costs, with each day being considered a separate violation. Additionally, the City of Ann Arbor has the right to modify, terminate, cancel or suspend a contract in the event of a violation of the Ordinance.

* Health Care benefits include those paid for by the employer or making an employer contribution toward the purchase of health care. The employee contribution must not exceed $.50 an hour for an average work week; and the employer cost or contribution must equal no less than $1/hr for the average work week.

The Law Requires Employers to Display This Poster Where Employees Can Readily See It.

For Additional Information or to File a Complaint contact
Colin Spencer at 734/794-6500 or cspencer@a2gov.org

Revised 2/1/2023

ATTACHEMENT G

Vendor Conflict of Interest Disclosure Form

All vendors interested in conducting business with the City of Ann Arbor must complete and return the Vendor Conflict of Interest Disclosure Form in order to be eligible to be awarded a contract. Please note that all vendors are subject to comply with the City of Ann Arbor's conflict of interest policies as stated within the certification section below.

If a vendor has a relationship with a City of Ann Arbor official or employee, an immediate family member of a City of Ann Arbor official or employee, the vendor shall disclose the information required below.

1. No City official or employee or City employee's immediate family member has an ownership interest in vendor's company or is deriving personal financial gain from this contract.
2. No retired or separated City official or employee who has been retired or separated from the City for less than one (1) year has an ownership interest in vendor's Company.
3. No City employee is contemporaneously employed or prospectively to be employed with the vendor.
4. Vendor hereby declares it has not and will not provide gifts or hospitality of any dollar value or any other gratuities to any City employee or elected official to obtain or maintain a contract.
5. Please note any exceptions below:

Conflict of Interest Disclosure*	
Name of City of Ann Arbor employees, elected officials or immediate family members with whom there may be a potential conflict of interest.	( ) Relationship to employee _____ ( ) Interest in vendor's company ( ) Other (please describe in box below)

*Disclosing a potential conflict of interest does not disqualify vendors. In the event vendors do not disclose potential conflicts of interest and they are detected by the City, vendor will be exempt from doing business with the City.

I certify that this Conflict of Interest Disclosure has been examined by me and that its contents are true and correct to my knowledge and belief and I have the authority to so certify on behalf of the Vendor by my signature below:		
Vendor Name	**Vendor Phone Number**	
Signature of Vendor Authorized Representative	**Date**	**Printed Name of Vendor Authorized Representative**

Questions about this form? Contact Procurement Office City of Ann Arbor Phone: 734/794-6500, procurement@a2gov.org

ATTACHMENT H

DECLARATION OF COMPLIANCE

Non-Discrimination Ordinance

The "non discrimination by city contractors" provision of the City of Ann Arbor Non-Discrimination Ordinance (Ann Arbor City Code Chapter 112, Section 9:158) requires all contractors proposing to do business with the City to treat employees in a manner which provides equal employment opportunity and does not discriminate against any of their employees, any City employee working with them, or any applicant for employment on the basis of actual or perceived age, arrest record, color, disability, educational association, familial status, family responsibilities, gender expression, gender identity, genetic information, height, HIV status, marital status, national origin, political beliefs, race, religion, sex, sexual orientation, source of income, veteran status, victim of domestic violence or stalking, or weight. It also requires that the contractors include a similar provision in all subcontracts that they execute for City work or programs.

In addition the City Non-Discrimination Ordinance requires that all contractors proposing to do business with the City of Ann Arbor must satisfy the contract compliance administrative policy adopted by the City Administrator. A copy of that policy may be obtained from the Purchasing Manager

The Contractor agrees:

(a) To comply with the terms of the City of Ann Arbor's Non-Discrimination Ordinance and contract compliance administrative policy, including but not limited to an acceptable affirmative action program if applicable.

(b) To post the City of Ann Arbor's Non-Discrimination Ordinance Notice in every work place or other location in which employees or other persons are contracted to provide services under a contract with the City.

(c) To provide documentation within the specified time frame in connection with any workforce verification, compliance review or complaint investigation.

(d) To permit access to employees and work sites to City representatives for the purposes of monitoring compliance, or investigating complaints of non-compliance.

The undersigned states that he/she has the requisite authority to act on behalf of his/her employer in these matters and has offered to provide the services in accordance with the terms of the Ann Arbor Non-Discrimination Ordinance. The undersigned certifies that he/she has read and is familiar with the terms of the Non-Discrimination Ordinance, obligates the Contractor to those terms and acknowledges that if his/her employer is found to be in violation of Ordinance it may be subject to civil penalties and termination of the awarded contract.

_____
Company Name

_____
Signature of Authorized Representative Date

_____
Print Name and Title

_____
Address, City, State, Zip

_____
Phone/Email Address

Questions about the Notice or the City Administrative Policy, Please contact:
Procurement Office of the City of Ann Arbor
(734) 794-6500

ATTACHMENT I

CITY OF ANN ARBOR NON-DISCRIMINATION ORDINANCE

Relevant provisions of Chapter 112, Nondiscrimination, of the Ann Arbor City Code are included below. You can review the entire ordinance at www.a2gov.org/humanrights.

Intent: It is the intent of the city that no individual be denied equal protection of the laws; nor shall any individual be denied the enjoyment of his or her civil or political rights or be discriminated against because of actual or perceived age, arrest record, color, disability, educational association, familial status, family responsibilities, gender expression, gender identity, genetic information, height, HIV status, marital status, national origin, political beliefs, race, religion, sex, sexual orientation, source of income, veteran status, victim of domestic violence or stalking, or weight.

Discriminatory Employment Practices: No person shall discriminate in the hire, employment, compensation, work classifications, conditions or terms, promotion or demotion, or termination of employment of any individual. No person shall discriminate in limiting membership, conditions of membership or termination of membership in any labor union or apprenticeship program.

Discriminatory Effects: No person shall adopt, enforce or employ any policy or requirement which has the effect of creating unequal opportunities according to actual or perceived age, arrest record, color, disability, educational association, familial status, family responsibilities, gender expression, gender identity, genetic information, height, HIV status, marital status, national origin, political beliefs, race, religion, sex, sexual orientation, source of income, veteran status, victim of domestic violence or stalking, or weight for an individual to obtain housing, employment or public accommodation, except for a bona fide business necessity. Such a necessity does not arise due to a mere inconvenience or because of suspected objection to such a person by neighbors, customers or other persons.

Nondiscrimination by City Contractors: All contractors proposing to do business with the City of Ann Arbor shall satisfy the contract compliance administrative policy adopted by the City Administrator in accordance with the guidelines of this section. All city contractors shall ensure that applicants are employed and that employees are treated during employment in a manner which provides equal employment opportunity and tends to eliminate inequality based upon any classification protected by this chapter. All contractors shall agree not to discriminate against an employee or applicant for employment with respect to hire, tenure, terms, conditions, or privileges of employment, or a matter directly or indirectly related to employment, because of any applicable protected classification. All contractors shall be required to post a copy of Ann Arbor's Non-Discrimination Ordinance at all work locations where its employees provide services under a contract with the city.

Complaint Procedure: If any individual believes there has been a violation of this chapter, he/she may file a complaint with the City's Human Rights Commission. The complaint must be filed within 180 calendar days from the date of the individual's knowledge of the allegedly discriminatory action or 180 calendar days from the date when the individual should have known of the allegedly discriminatory action. A complaint that is not filed within this timeframe cannot be considered by the Human Rights Commission. To file a complaint, first complete the complaint form, which is available at www.a2gov.org/humanrights. Then submit it to the Human Rights Commission by e-mail (hrc@a2gov.org), by mail (Ann Arbor Human Rights Commission, PO Box 8647, Ann Arbor, MI 48107), or in person (City Clerk's Office). For further information, please call the commission at 734-794-6141 or e-mail the commission at hrc@a2gov.org.

Private Actions For Damages or Injunctive Relief: To the extent allowed by law, an individual who is the victim of discriminatory action in violation of this chapter may bring a civil action for appropriate injunctive relief or damages or both against the person(s) who acted in violation of this chapter.

THIS IS AN OFFICIAL GOVERNMENT NOTICE AND
MUST BE DISPLAYED WHERE EMPLOYEES CAN READILY SEE IT.

Michigan Department
Of Transportation
CP-347 (04/10)

MICHIGAN DEPARTMENT OF TRANSPORTATION

CERTIFIED PAYROLL

COMPLETION OF CERTIFIED PAYROLL FORM FULFILLS THE MINIMUM MDOT PREVAILING WAGE REQUIREMENTS

(1) NAME OF CONTRACTOR / SUBCONTRACTOR (CIRCLE ONE) (2) ADDRESS

(3) PAYROLL NO. (4) FOR WEEK ENDING (5) PROJECT AND LOCATION (6) CONTRACT ID

(a)	(b)	(c)	(d) DAY AND DATE							(e)	(f)	(g)	(h)	(i)	(j) DEDUCTIONS						(k)
EMPLOYEE INFORMATION	WORK CLASSIFICATION	Hour Type	HOURS WORKED ON PROJECT							TOTAL HOURS ON PROJECT	PROJECT RATE OF PAY	PROJECT RATE OF FRINGE PAY	GROSS PROJECT EARNED / GROSS WEEKLY EARNED	TOTAL WEEKLY HOURS WORKED ALL JOBS	FICA	FEDERAL	STATE		OTHER	TOTAL DEDUCT	TOTAL WEEKLY WAGES PAID FOR ALL JOBS
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											
NAME:										0			$0.00							$0.00	$0.00
ETH/GEN: ID #:	GROUP/CLASS #:	S								0											

Date _____

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

do hereby state:

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

_____ on the
(Contractor or Subcontractor)

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

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

_____ from the full
(Contractor or Subcontractor)

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

_____

_____

_____

_____

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

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

(4) That:

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

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

(b) WHERE FRINGE BENEFITS ARE PAID IN CASH

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

(c) EXCEPTIONS

EXCEPTION (CRAFT)	EXPLANATION

REMARKS:

NAME AND TITLE	SIGNATURE

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

EPAC Permit 4-2-21

TRAFFIC SIGNAL TIMING PERMIT

	PHASE	1	2	3	4	5	6	7	8			
APPROACH			EB/WB		NB				NB			
MINIMUM GREEN			15		8				8			
PASSAGE			0.0		3.0				3.0			
MAXIMUM NO. 1			99		41				41			
MAXIMUM NO. 2			0		0				0			
YELLOW CHANGE			3.1		3.1				3.0			
RED CLEARANCE			2.5		2.5				3.8			
WALK			8		8							
PEDESTRIAN CLEARANCE			16		12							
EXTENDED PED. CLEARANCE			3		3							
REST IN WALK			1		0							
INITIALIZATION			4		1				1			
NON-ACT RESPONSE			0		0				0			
VEHICLE RECALL			3		0				0			
PEDESTRIAN RECALL			0		0				0			
NON-LOCK MEMORY			0		0				0			
DUAL ENTRY			0		1				1			
	CYCLE									O1	O2	O3
DIAL 1 SPLIT 1	90		55		35				35	65		
DIAL 2 SPLIT 1	120		87		33				33	79		
DIAL 3 SPLIT 1	140		99		41				41	13		
DIAL SPLIT												
DIAL SPLIT												
DIAL SPLIT												
	MODE		1		0				0			

PHASE

1

2 EMCD EB/WB

3

4 Cancer Center NB

5

6

7

8 WMCD NB

Hours of Operation:

D1/S1/O1: Normal
D2/S1/O1: 07:00 to 09:00 Monday-Friday
D3/S1/O1: 14:00 to 17:00 Monday-Friday

OVERLAPS

Overlap Phase	Load Bays	Phases Overlapped	T.G. (s)	Y (s)	R (s)	-G/Y	+GRN
=							
=							
=							
=							

TIMING INSTALLED

REMARKS
This timing plan is for EMCD bridge construction Stage 1.

PREPARED BY: DLZ DATE: 09/09/22

FLASH HOURS: DAILY ☐ NONE ☒ to

NIGHT FLASH:
FY = FR =

CONFLICT FLASH:
FY = FR = All Directions

CONTROLLER TYPE:
☒ EPAC
☐ Other:

PRE-EMPT ☐
COUNTDOWN PEDS ☒

LOCATION:
EMCD & WMCD & Cancer Center
CITY/TWP: Ann Arbor
COUNTY : Washtenaw

MILE POINT | CONTROL SECTION-SPOT # 139

Job # (If Applicable):

Page 3 included only if Pre-Empt Checked

EPAC Permit 4-2-21

ADVANCED TIMING PARAMETERS FORM

SYSTEM INFORMATION

Controller Type:
- ☒ EPAC
- ☐ Other:

System Type:
- ☐ Closed Loop
  - ☐ Stand By
  - ☐ Group 1
  - ☐ Group 2
  - Address:
- ☒ TBC
- ☐ TBC/GPS
- ☐ None
- ☐ Other:

If TBC, Sync by:
- ☒ TOD
- ☐ Event

Interconnect Type:
- ☐ Hardwire
- ☐ Fiber-Optic
- ☐ Radio
- ☐ Cell Modem
- ☒ None
- ☐ Other:

If Cell Modem:
Phone #

Controller Status:
- ☐ Primary
- ☐ Secondary
- ☐ Isolated
- ☒ TBC

If Secondary, Primary Location:

Primary Spot # :

LEFT-TURN PHASING

Phase # / Description	Permissive-Protected Lead	Permissive-Protected Lag	Protected-Only Split	Protected-Only Lead	Protected-Only Lag
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

RING AND BARRIER STRUCTURE

	B1				B2				B3				B4			
R1	2				4											
R2					8											
R3																
R4																

VEHICULAR AND PEDESTRIAN DETECTION

Approach	Vehicular Detection: Movements and Call Delay (s) Left		Thru		Right		Type: Loop	Video	Other	Pedestrian Detection: Push-Button Crossing Locations
NB (WMCD)	☒		☐		☒		☐	☒	☐	S Leg of WMCD
NB (Cancer Center)	☒		☐		☒		☐	☒	☐	W & E Legs of EMCD
	☐		☐		☐		☐	☐	☐	S Leg of Cancer Center
	☐		☐		☐		☐	☐	☐	
	☐		☐		☐		☐	☐	☐	
	☐		☐		☐		☐	☐	☐	

DISAPPEARING LEGEND CASE SIGNS

ADDITIONAL DIAL SPLIT DATA

		PHASE	1	2	3	4	5	6	7	8	O1	O2	O3
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											

COORDINATION DATA

Operation Mode	1
Coordination Mode	0
Maximum Mode	0
Correction Mode	3
Offset Mode	0
Force Mode	0
Max Dwell	0
Yield Period	0

REMARKS:

ADDITIONAL OVERLAP DATA

Overlap Phase	Load Bays	Phases Overlapped	T.G. (s)	Y (s)	R (s)	-G/Y	+GRN
=							
=							
=							
=							

PREPARED BY: DLZ DATE: 09/09/22

☐ MDOT ☐ County ☐ City ☒ Consultant

LOCATION:
EMCD & WMCD & Cancer Center

CONTROL SECTION-SPOT #
139

CLEAR PAGE 2

EPAC Permit 4-2-21

TRAFFIC SIGNAL TIMING PERMIT

	PHASE	1	2	3	4	5	6	7	8			
APPROACH		EB-Left	WB-Thru	SB-Left	NB-Thru	WB-Left	EB-Thru	NB-Left	SB-Thru			
MINIMUM GREEN		5	10	5	5	5	10	5	7			
PASSAGE		2.0	0.0	2.0	3.0	2.0	0.0	2.0	3.0			
MAXIMUM NO. 1		31	47	21	41	32	46	28	34			
MAXIMUM NO. 2												
YELLOW CHANGE		3.6	3.6	3.1	3.1	3.6	3.6	3.1	3.1			
RED CLEARANCE		2.5	2.5	3.3	3.3	2.5	2.5	3.3	3.3			
WALK			8		7		9		10			
PEDESTRIAN CLEARANCE			17		19		17		14			
EXTENDED PED. CLEARANCE			3		3		3		3			
REST IN WALK			0		0		0		0			
INITIALIZATION		1	4	1	4	1	4	1	4			
NON-ACT RESPONSE		0	0	0	0	0	0	0	0			
VEHICLE RECALL		2	3	0	0	2	3	0	0			
PEDESTRIAN RECALL			0		0		0		0			
NON-LOCK MEMORY		0	0	0	0	0	0	0	0			
DUAL ENTRY		0	1	0	1	0	1	0	1			
	CYCLE									O1	O2	O3
DIAL 1	SPLIT 1	90	12	33	12	33	12	33	12	33	0	0	0
DIAL 2	SPLIT 1	120	26	37	17	40	22	41	25	32	0	0	0
DIAL 3	SPLIT 1	140	31	47	21	41	32	46	28	34	0		
DIAL	SPLIT												
DIAL	SPLIT												
DIAL	SPLIT												
	MODE	0	1	0	0	0	1	0	0			

PHASE

1 Fuller EB-Left
2 Fuller WB-Thru
3 Maiden SB-Left
4 EMCD NB-Thru
5 Fuller WB-Left
6 Fuller EB-Thru
7 EMCD NB-Left
8 Maiden SB-Thru

Hours of Operation:

D1/S1/O1: Normal
D2/S1/O1: 07:00 to 09:00 Monday-Friday
D3/S1/O1: 14:00 to 17:00 Monday-Friday

OVERLAPS

Overlap Phase	*Load Bays*	*Phases Overlapped*	T.G. (s)	Y (s)	R (s)	-G/Y	+GRN
=							
=							
=							
=							

TIMING INSTALLED

REMARKS
This timing plan is for EMCD bridge construction Stage 1.

PREPARED BY: DLZ DATE: 09/09/22

FLASH HOURS: DAILY ☐ NONE ☒ to

NIGHT FLASH:
FY = FR =

CONFLICT FLASH:
FY = FR = All Directions

CONTROLLER TYPE:
☒ EPAC
☐ Other:

PRE-EMPT ☐
COUNTDOWN PEDS ☒

LOCATION:
Fuller & Maiden/EMCD
CITY/TWP: Ann Arbor
COUNTY : Washtenaw

MILE POINT
CONTROL SECTION-SPOT #
126

Job # (If Applicable):

Page 3 included only if Pre-Empt Checked

EPAC Permit 4-2-21

ADVANCED TIMING PARAMETERS FORM

SYSTEM INFORMATION

Controller Type:
- [x] EPAC
- [ ] Other:

System Type:
- [ ] Closed Loop
  - [ ] Stand By
  - [ ] Group 1
  - [ ] Group 2
  - Address:
- [x] TBC
- [ ] TBC/GPS
- [ ] None
- [ ] Other:

If TBC, Sync by:
- [x] TOD
- [ ] Event

Interconnect Type:
- [ ] Hardwire
- [ ] Fiber-Optic
- [ ] Radio
- [ ] Cell Modem
- [x] None
- [ ] Other:

If Cell Modem:
Phone #

Controller Status:
- [ ] Primary
- [ ] Secondary
- [ ] Isolated
- [x] TBC

If Secondary,
Primary Location:

Primary
Spot # :

LEFT-TURN PHASING

Phase # / Description	*Permissive-Protected* Lead	*Permissive-Protected* Lag	*Protected-Only* Split	*Protected-Only* Lead	*Protected-Only* Lag
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

RING AND BARRIER STRUCTURE

	B1				B2				B3				B4			
R1	1	2			3	4										
R2	5	6			7	8										
R3																
R4																

VEHICULAR AND PEDESTRIAN DETECTION

Approach	*Vehicular Detection* Movements and Call Delay (s) Left		Thru		Right		Type Loop	Type Video	Type Other	*Pedestrian Detection* Push-Button Crossing Locations
NB	☒		☒		☒		☐	☒	☐	All legs
SB	☒		☒		☒		☐	☒	☐	
WB	☒		☒		☒		☐	☒	☐	
EB	☒		☒		☒		☐	☒	☐	
	☐		☐		☐		☐	☐	☐	
	☐		☐		☐		☐	☐	☐	

DISAPPEARING LEGEND CASE SIGNS

ADDITIONAL DIAL SPLIT DATA

		PHASE	1	2	3	4	5	6	7	8	O1	O2	O3
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											

COORDINATION DATA

Operation Mode	1
Coordination Mode	0
Maximum Mode	0
Correction Mode	3
Offset Mode	0
Force Mode	0
Max Dwell	0
Yield Period	0

REMARKS:

ADDITIONAL OVERLAP DATA

Overlap Phase	*Load Bays*	*Phases Overlapped*	T.G. (s)	Y (s)	R (s)	-G/Y	+GRN
=							
=							
=							
=							

PREPARED BY: DLZ DATE: 09/09/22

☐ MDOT ☐ County ☐ City ☒ Consultant

LOCATION:
Fuller & Maiden/EMCD

CONTROL SECTION-SPOT #
126

CLEAR PAGE 2

EPAC Permit 4-2-21

TRAFFIC SIGNAL TIMING PERMIT

	PHASE	1	2	3	4	5	6	7	8			
APPROACH		SB-Left	SB	NB	WB							
MINIMUM GREEN		5	7	7	10							
PASSAGE		4.0	4.0	4.0	4.0							
MAXIMUM NO. 1		24	40	30	45							
MAXIMUM NO. 2		23	23	46	45							
YELLOW CHANGE		3.1	3.1	3.1	3.1							
RED CLEARANCE		3.7	3.7	3.7	2.7							
WALK				7	7							
PEDESTRIAN CLEARANCE				20	17							
EXTENDED PED. CLEARANCE				3	3							
REST IN WALK				1	0							
INITIALIZATION		1	4	4	1							
NON-ACT RESPONSE		0	0	0	0							
VEHICLE RECALL		0	0	0	0							
PEDESTRIAN RECALL		0	0	2	2							
NON-LOCK MEMORY		1	0	0	0							
DUAL ENTRY		0	1	1	0							
	CYCLE									O1	O2	O3
DIAL 1 SPLIT 1	80	15	46	31	34					0		
DIAL 2 SPLIT 1	80	24	52	28	28					0		
DIAL 3 SPLIT 1	90	15	41 46	26 31	49 44					82		
DIAL 3 SPLIT 2	90	12 15	38 46	26 31	52 44					0		
DIAL SPLIT												
DIAL SPLIT												
	MODE	0	1	1	0							

PHASE

1 Observatory SB-Left

2 Observatory SB-Thru

3 Observatory NB-Thru

4 EMCD WB

5

6

7

8 All Peds

Hours of Operation:

D1/S1/O1: Normal
D2/S1/O1: 09:00 to 15:15 Monday-Friday
D3/S1/O1: 06:30 to 09:00 Monday-Friday
D3/S2/O1: 15:15 to 18:30 Monday-Friday

OVERLAPS

Overlap Phase	*Load Bays*	*Phases Overlapped*	T.G. (s)	Y (s)	R (s)	-G/Y	+GRN
A = SB FYA LT	5		0.0	3.1	3.7	3	1
=							
=							
=							

TIMING INSTALLED

REMARKS

This timing plan is for EMCD bridge construction Stages 1, 2, and 3.

Anything outside of the weekday peak hours, maintain existing timings.

Phase 4 Leading Pedestrian Interval = 5 sec.

PREPARED BY: DLZ DATE: 09/09/22

FLASH HOURS:

20:00 to 05:45 DAILY ☒ NONE ☐

20:00 to 06:30 Saturday & Sunday

NIGHT FLASH:

FY = FR = All directions

CONFLICT FLASH:

FY = FR = All directions

CONTROLLER TYPE:

☒ EPAC

☐ Other:

PRE-EMPT ☐

COUNTDOWN PEDS ☒

LOCATION:

EMCD at Observatory

CITY/TWP: Ann Arbor

COUNTY : Washtenaw

MILE POINT

CONTROL SECTION-SPOT #

23

Job # (If Applicable):

Page 3 included only if Pre-Empt Checked

ADVANCED TIMING PARAMETERS FORM

SYSTEM INFORMATION

Controller Type:
- ☒ EPAC
- ☐ Other:

System Type:
- ☐ Closed Loop
  - ☐ Stand By
  - ☐ Group 1
  - ☐ Group 2
  - Address:
- ☒ TBC
- ☐ TBC/GPS
- ☐ None
- ☐ Other:

If TBC, Sync by:
- ☒ TOD
- ☐ Event

Interconnect Type:
- ☐ Hardwire
- ☐ Fiber-Optic
- ☐ Radio
- ☐ Cell Modem
- ☒ None
- ☐ Other:

If Cell Modem:
Phone #

Controller Status:
- ☐ Primary
- ☐ Secondary
- ☐ Isolated
- ☒ TBC

If Secondary,
Primary Location:

Primary
Spot # :

LEFT-TURN PHASING

Phase # / Description	*Permissive-Protected* Lead	*Permissive-Protected* Lag	*Protected-Only* Split	*Protected-Only* Lead	*Protected-Only* Lag
Phase 1/SB Observatory LT	☐	☒	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

RING AND BARRIER STRUCTURE

	B1				B2				B3				B4			
R1	1	3			4											
R2	2															
R3																
R4																

VEHICULAR AND PEDESTRIAN DETECTION

Approach	*Vehicular Detection* Movements and Call Delay (s): Left		Thru		Right		Type: Loop	Video	Other	*Pedestrian Detection* Push-Button Crossing Locations
SB Observatory	☒		☒		☐		☐	☐	☒	
NB Observatory	☐		☒		☒		☐	☐	☒	
WB EMCD	☒		☐		☒		☐	☐	☒	
	☐		☐		☐		☐	☐	☐	
	☐		☐		☐		☐	☐	☐	
	☐		☐		☐		☐	☐	☐	

DISAPPEARING LEGEND CASE SIGNS

ADDITIONAL DIAL SPLIT DATA

		PHASE	1	2	3	4	5	6	7	8	O1	O2	O3
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											

COORDINATION DATA

Operation Mode	1
Coordination Mode	0
Maximum Mode	0
Correction Mode	3
Offset Mode	0
Force Mode	0
Max Dwell	0
Yield Period	0

REMARKS:

ADDITIONAL OVERLAP DATA

Overlap Phase	*Load Bays*	*Phases Overlapped*	T.G. (s)	Y (s)	R (s)	-G/Y	+GRN
=							
=							
=							
=							

PREPARED BY: DLZ DATE: 09/09/22

☐ MDOT ☐ County ☐ City ☒ Consultant

LOCATION:
EMCD at Observatory

CONTROL SECTION-SPOT #
23

CLEAR PAGE 2

EPAC Permit 4-2-21

TRAFFIC SIGNAL TIMING PERMIT

	PHASE	1	2	3	4	5	6	7	8			
APPROACH			NB-SB		WB				EB			
MINIMUM GREEN			8		8				8			
PASSAGE			4.0		4.0				4.0			
MAXIMUM NO. 1			45		35				35			
MAXIMUM NO. 2			45		35				22			
YELLOW CHANGE			3.6		3.6				3.6			
RED CLEARANCE			2.5		2.5				2.5			
WALK			4						6			
PEDESTRIAN CLEARANCE			10						13			
EXTENDED PED. CLEARANCE			0						0			
REST IN WALK			0						0			
INITIALIZATION			4		1				1			
NON-ACT RESPONSE			1		2				2			
VEHICLE RECALL			3		3				3			
PEDESTRIAN RECALL			2		0				2			
NON-LOCK MEMORY			0		0				0			
DUAL ENTRY			0		0				0			
	CYCLE									O1	O2	O3
DIAL 1 SPLIT 1	70		26		17				27	17		
DIAL 2 SPLIT 1	90		43		20				27	5		
DIAL 3 SPLIT 1	90		44		19				27	5		
DIAL 3 SPLIT 3	90		43		20				27	5		
DIAL SPLIT												
DIAL SPLIT												
	MODE		1		7				5			

PHASE

1

2 Glen NB and SB

3

4 Catherine WB

5

6

7

8 Catherine EB

Hours of Operation:

D1/S1/O1: Normal
D3/S3/O1: 06:30 to 09:00 Monday-Friday
D2/S1/O1: 09:00 to 15:15 Monday-Friday & 19:00 to 00:01 Saturday-Sunday
D3/S1/O1: 15:15 to 18:30 Monday-Friday & 10:00 to 19:00 Saturday-Sunday

OVERLAPS

Overlap Phase	*Load Bays*	*Phases Overlapped*	T.G. (s)	Y (s)	R (s)	-G/Y	+GRN
=							
=							
=							
=							

TIMING INSTALLED

REMARKS

This timing plan is for EMCD bridge construction Stages 1, 2, and 3.

5.0 seconds leading ped timing for crossing Glen (Ph. 8)

PREPARED BY: DLZ DATE: 09/21/22

FLASH HOURS:

00:01 to 05:15 DAILY ☒ NONE ☐

00:01 to 06:30 Saturday - Sunday

NIGHT FLASH:

FY = NB/SB Glen FR = EB/WB Catherine

CONFLICT FLASH:

FY = FR = All legs

CONTROLLER TYPE:

☒ EPAC
☐ Other:

PRE-EMPT ☐
COUNTDOWN PEDS ☒

LOCATION:

Catherine at Glenn

CITY/TWP: City of Ann Arbor

COUNTY : Washtenaw

MILE POINT

CONTROL SECTION-SPOT #

88

Job # (If Applicable):

Page 3 included only if Pre-Empt Checked

ADVANCED TIMING PARAMETERS FORM

SYSTEM INFORMATION

Controller Type:
- ☒ EPAC
- ☐ Other:

System Type:
- ☐ Closed Loop
  - ☐ Stand By
  - ☐ Group 1
  - ☐ Group 2
  - Address:
- ☒ TBC
- ☐ TBC/GPS
- ☐ None
- ☐ Other:

If TBC, Sync by:
- ☒ TOD
- ☐ Event

Interconnect Type:
- ☐ Hardwire
- ☐ Fiber-Optic
- ☐ Radio
- ☐ Cell Modem
- ☒ None
- ☐ Other:

If Cell Modem:
Phone #

Controller Status:
- ☐ Primary
- ☐ Secondary
- ☐ Isolated
- ☒ TBC

If Secondary,
Primary Location:

Primary
Spot # :

LEFT-TURN PHASING

Phase # / Description	*Permissive-Protected* Lead	*Permissive-Protected* Lag	*Protected-Only* Split	*Protected-Only* Lead	*Protected-Only* Lag
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

RING AND BARRIER STRUCTURE

	B1				B2				B3				B4			
R1	1	8			4				2							
R2																
R3																
R4																

VEHICULAR AND PEDESTRIAN DETECTION

Approach	*Vehicular Detection* Movements and Call Delay (s) Left		Thru		Right		Type Loop	Video	Other	*Pedestrian Detection* Push-Button Crossing Locations
	☐		☐		☐		☐	☐	☐	
	☐		☐		☐		☐	☐	☐	
	☐		☐		☐		☐	☐	☐	
	☐		☐		☐		☐	☐	☐	
	☐		☐		☐		☐	☐	☐	
	☐		☐		☐		☐	☐	☐	

DISAPPEARING LEGEND CASE SIGNS

ADDITIONAL DIAL SPLIT DATA

		PHASE	1	2	3	4	5	6	7	8	O1	O2	O3
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											

COORDINATION DATA

Operation Mode	1
Coordination Mode	0
Maximum Mode	0
Correction Mode	3
Offset Mode	0
Force Mode	0
Max Dwell	0
Yield Period	0

REMARKS:

ADDITIONAL OVERLAP DATA

Overlap Phase	*Load Bays*	*Phases Overlapped*	T.G. (s)	Y (s)	R (s)	-G/Y	+GRN
=							
=							
=							
=							

PREPARED BY: DLZ DATE: 09/21/22

☐ MDOT ☐ County ☐ City ☒ Consultant

LOCATION:
Catherine at Glenn

CONTROL SECTION-SPOT #
88

CLEAR PAGE 2

PREEMPTION INFORMATION FORM

Preemption Description:

Preempt # =	Time (s)	Phases		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SEL Ped Cl		Vehicle	Track																
SEL Yellow			Dwell																
SEL Red Cl			Cycle																
TRACK Green			Exit																
TRACK Ped Cl		Ped	Track																
TRACK Yellow			Dwell																
TRACK Red CL			Cycle																
DWELL Green		Overlap Vehicle	Overlap	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
RET Ped Cl			Track																
RET Yellow			Dwell																
RET Red Cl			Cycle																

☐ Locking

☐ Non-Locking

Delay (s)	
Extend (s)	
Duration (s)	
Max Call (s)	
Lockout (s)	
Link PE #	

Preemption Description:

Preempt # =	Time (s)	Phases		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SEL Ped Cl		Vehicle	Track																
SEL Yellow			Dwell																
SEL Red Cl			Cycle																
TRACK Green			Exit																
TRACK Ped Cl		Ped	Track																
TRACK Yellow			Dwell																
TRACK Red CL			Cycle																
DWELL Green		Overlap Vehicle	Overlap	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
RET Ped Cl			Track																
RET Yellow			Dwell																
RET Red Cl			Cycle																

☐ Locking

☐ Non-Locking

Delay (s)	
Extend (s)	
Duration (s)	
Max Call (s)	
Lockout (s)	
Link PE #	

Preemption Description:

Preempt # =	Time (s)	Phases		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SEL Ped Cl		Vehicle	Track																
SEL Yellow			Dwell																
SEL Red Cl			Cycle																
TRACK Green			Exit																
TRACK Ped Cl		Ped	Track																
TRACK Yellow			Dwell																
TRACK Red CL			Cycle																
DWELL Green		Overlap Vehicle	Overlap	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
RET Ped Cl			Track																
RET Yellow			Dwell																
RET Red Cl			Cycle																

☐ Locking

☐ Non-Locking

Delay (s)	
Extend (s)	
Duration (s)	
Max Call (s)	
Lockout (s)	
Link PE #	

Preemption Description:

Preempt # =	Time (s)	Phases		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SEL Ped Cl		Vehicle	Track																
SEL Yellow			Dwell																
SEL Red Cl			Cycle																
TRACK Green			Exit																
TRACK Ped Cl		Ped	Track																
TRACK Yellow			Dwell																
TRACK Red CL			Cycle																
DWELL Green		Overlap Vehicle	Overlap	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
RET Ped Cl			Track																
RET Yellow			Dwell																
RET Red Cl			Cycle																

☐ Locking

☐ Non-Locking

Delay (s)	
Extend (s)	
Duration (s)	
Max Call (s)	
Lockout (s)	
Link PE #	

Preempt System Data

Ring	1	2	3	4	
MIN GRN/WLK (s)					
Priority	PE/FL	PE1/2	PE2/3	PE3/4	PE4/5	PE5/6
Status						

REMARKS :

PREPARED BY: DLZ DATE: 09/21/22

LOCATION:

Catherine at Glenn

CONTROL SECTION-SPOT #
88

CLEAR PAGE 3

EPAC Permit 4-2-21

TRAFFIC SIGNAL TIMING PERMIT

	PHASE	1	2	3	4	5	6	7	8			
APPROACH			EB/WB		NB				NB			
MINIMUM GREEN			15		8				8			
PASSAGE			0.0		3.0				3.0			
MAXIMUM NO. 1			99		41				41			
MAXIMUM NO. 2			0		0				0			
YELLOW CHANGE			3.1		3.1				3.0			
RED CLEARANCE			2.5		2.5				3.8			
WALK			8		8							
PEDESTRIAN CLEARANCE			16		12							
EXTENDED PED. CLEARANCE			3		3							
REST IN WALK			1		0							
INITIALIZATION			4		1				1			
NON-ACT RESPONSE			0		0				0			
VEHICLE RECALL			3		0				0			
PEDESTRIAN RECALL			0		0				0			
NON-LOCK MEMORY			0		0				0			
DUAL ENTRY			0		1				1			
	CYCLE									O1	O2	O3
DIAL 1 SPLIT 1	90		55		35				35	65		
DIAL 2 SPLIT 1	120		87		33				33	6		
DIAL 3 SPLIT 1	140		99		41				41	35		
DIAL SPLIT												
DIAL SPLIT												
DIAL SPLIT												
	MODE		1		0				0			

PHASE

1

2 EMCD EB/WB

3

4 Cancer Center NB

5

6

7

8 WMCD NB

Hours of Operation:

D1/S1/O1: Normal
D2/S1/O1: 07:00 to 09:00 Monday-Friday
D3/S1/O1: 14:00 to 17:00 Monday-Friday

OVERLAPS

Overlap Phase	Load Bays	Phases Overlapped	T.G. (s)	Y (s)	R (s)	-G/Y	+GRN
=							
=							
=							
=							

TIMING INSTALLED

REMARKS
This timing plan is for EMCD bridge construction Stage 2.

PREPARED BY: DLZ DATE: 09/09/22

FLASH HOURS: DAILY ☐ NONE ☒ to

NIGHT FLASH:
FY = FR =

CONFLICT FLASH:
FY = FR = All Directions

CONTROLLER TYPE:
☒ EPAC
☐ Other:

PRE-EMPT ☐
COUNTDOWN PEDS ☒

LOCATION:
EMCD & WMCD & Cancer Center
CITY/TWP: Ann Arbor
COUNTY : Washtenaw

MILE POINT
CONTROL SECTION-SPOT #
139

Job # (If Applicable):

Page 3 included only if Pre-Empt Checked

EPAC Permit 4-2-21

ADVANCED TIMING PARAMETERS FORM

SYSTEM INFORMATION

Controller Type:
- [X] EPAC
- [ ] Other:

System Type:
- [ ] Closed Loop
  - [ ] Stand By
  - [ ] Group 1
  - [ ] Group 2
  - Address:
- [X] TBC
- [ ] TBC/GPS
- [ ] None
- [ ] Other:

If TBC, Sync by:
- [X] TOD
- [ ] Event

Interconnect Type:
- [ ] Hardwire
- [ ] Fiber-Optic
- [ ] Radio
- [ ] Cell Modem
- [X] None
- [ ] Other:

If Cell Modem:
Phone #

Controller Status:
- [ ] Primary
- [ ] Secondary
- [ ] Isolated
- [X] TBC

If Secondary,
Primary Location:

Primary
Spot # :

LEFT-TURN PHASING

Phase # / Description	*Permissive-Protected* Lead	*Permissive-Protected* Lag	*Protected-Only* Split	*Protected-Only* Lead	*Protected-Only* Lag
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

RING AND BARRIER STRUCTURE

	B1				B2				B3				B4			
R1	2				4											
R2					8											
R3																
R4																

VEHICULAR AND PEDESTRIAN DETECTION

Approach	*Vehicular Detection* Movements and Call Delay (s) Left		Thru		Right		Type Loop	Video	Other	*Pedestrian Detection* Push-Button Crossing Locations
NB (WMCD)	☒		☐		☒		☐	☒	☐	S Leg of EMCD at Cancer Ctr
NB (Cancer Center)	☒		☐		☒		☐	☒	☐	E Leg of EMCD at Cancer Ctr
	☐		☐		☐		☐	☐	☐	
	☐		☐		☐		☐	☐	☐	
	☐		☐		☐		☐	☐	☐	
	☐		☐		☐		☐	☐	☐	

DISAPPEARING LEGEND CASE SIGNS

ADDITIONAL DIAL SPLIT DATA

		PHASE	1	2	3	4	5	6	7	8	O1	O2	O3
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											

COORDINATION DATA

Operation Mode	1
Coordination Mode	0
Maximum Mode	0
Correction Mode	3
Offset Mode	0
Force Mode	0
Max Dwell	0
Yield Period	0

REMARKS:

ADDITIONAL OVERLAP DATA

Overlap Phase	*Load Bays*	*Phases Overlapped*	T.G. (s)	Y (s)	R (s)	-G/Y	+GRN
=							
=							
=							
=							

PREPARED BY: DLZ DATE: 09/09/22

☐ MDOT ☐ County ☐ City ☒ Consultant

LOCATION:
EMCD & WMCD & Cancer Center

CONTROL SECTION-SPOT #
139

CLEAR PAGE 2

EPAC Permit 4-2-21

TRAFFIC SIGNAL TIMING PERMIT

	PHASE	1	2	3	4	5	6	7	8			
APPROACH		EB-Left	WB-Thru		NB-Thru	WB-Left	EB-Thru		SB-Thru			
MINIMUM GREEN		5	10		5	5	10		7			
PASSAGE		2.0	0.0		3.0	2.0	0.0		3.0			
MAXIMUM NO. 1		24	45		70	25	45		70			
MAXIMUM NO. 2												
YELLOW CHANGE		3.6	3.6		3.1	3.6	3.6		3.1			
RED CLEARANCE		2.5	2.5		3.3	2.5	2.5		3.3			
WALK			8		8		9		10			
PEDESTRIAN CLEARANCE			17		19		17		14			
EXTENDED PED. CLEARANCE			3		3		3		3			
REST IN WALK			0		0		0		0			
INITIALIZATION		1	4		4	1	4		4			
NON-ACT RESPONSE		0	0		0	0	0		0			
VEHICLE RECALL		2	3		0	2	3		0			
PEDESTRIAN RECALL			0		0		0		0			
NON-LOCK MEMORY		0	0		0	0	0		0			
DUAL ENTRY		0	1		1	0	1		1			
	CYCLE									O1	O2	O3
DIAL 1 SPLIT 1	90	12	35		43	12	35		43	0	0	0
DIAL 2 SPLIT 1	120	22	42		56	23	41		56	0	0	0
DIAL 3 SPLIT 1	140	24	46		70	24	46		70	0	0	0
DIAL SPLIT												
DIAL SPLIT												
DIAL SPLIT												
	MODE	0	1		0	0	1		0			

PHASE

1 Fuller EB-Left

2 Fuller WB-Thru

3

4 EMCD NB-Thru

5 Fuller WB-Left

6 Fuller EB-Thru

7

8 Maiden SB-Thru

Hours of Operation:

D1/S1/O1: Normal
D2/S1/O1: 07:00 to 09:00 Monday-Friday
D3/S1/O1: 14:00 to 17:00 Monday-Friday

OVERLAPS

Overlap Phase	*Load Bays*	*Phases Overlapped*	T.G. (s)	Y (s)	R (s)	-G/Y	+GRN
=							
=							
=							
=							

TIMING INSTALLED

REMARKS
This timing plan is for EMCD bridge construction Stage 2.

PREPARED BY: DLZ DATE: 09/09/22

FLASH HOURS: DAILY ☐ NONE ☒
to

NIGHT FLASH:
FY = FR =

CONFLICT FLASH:
FY = FR = All Directions

CONTROLLER TYPE:
☒ EPAC
☐ Other:

PRE-EMPT ☐
COUNTDOWN PEDS ☒

LOCATION:
Fuller & Maiden/EMCD
CITY/TWP: Ann Arbor
COUNTY : Washtenaw

MILE POINT
CONTROL SECTION-SPOT #
126

Job # (If Applicable):

Page 3 included only if Pre-Empt Checked

EPAC Permit 4-2-21

ADVANCED TIMING PARAMETERS FORM

SYSTEM INFORMATION

Controller Type:
- ☒ EPAC
- ☐ Other:

System Type:
- ☐ Closed Loop
  - ☐ Stand By
  - ☐ Group 1
  - ☐ Group 2
  - Address:
- ☒ TBC
- ☐ TBC/GPS
- ☐ None
- ☐ Other:

If TBC, Sync by:
- ☒ TOD
- ☐ Event

Interconnect Type:
- ☐ Hardwire
- ☐ Fiber-Optic
- ☐ Radio
- ☐ Cell Modem
- ☒ None
- ☐ Other:

If Cell Modem:
Phone #

Controller Status:
- ☐ Primary
- ☐ Secondary
- ☐ Isolated
- ☒ TBC

If Secondary, Primary Location:

Primary Spot # :

LEFT-TURN PHASING

Phase # / Description	*Permissive-Protected* Lead	*Permissive-Protected* Lag	*Protected-Only* Split	*Protected-Only* Lead	*Protected-Only* Lag
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

RING AND BARRIER STRUCTURE

	B1				B2				B3				B4			
R1	1	2			4											
R2	5	6			8											
R3																
R4																

VEHICULAR AND PEDESTRIAN DETECTION

Approach	Vehicular Detection: Movements and Call Delay (s) Left		Thru		Right		Type: Loop	Video	Other	Pedestrian Detection: Push-Button Crossing Locations
NB	☒		☒		☒		☐	☒	☐	All legs
SB	☒		☒		☒		☐	☒	☐	
WB	☒		☒		☒		☐	☒	☐	
EB	☒		☒		☒		☐	☒	☐	
	☐		☐		☐		☐	☐	☐	
	☐		☐		☐		☐	☐	☐	

DISAPPEARING LEGEND CASE SIGNS

ADDITIONAL DIAL SPLIT DATA

		PHASE	1	2	3	4	5	6	7	8	O1	O2	O3
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											

COORDINATION DATA

Operation Mode	1
Coordination Mode	0
Maximum Mode	0
Correction Mode	3
Offset Mode	0
Force Mode	0
Max Dwell	0
Yield Period	0

REMARKS:

ADDITIONAL OVERLAP DATA

Overlap Phase	*Load Bays*	*Phases Overlapped*	T.G. (s)	Y (s)	R (s)	-G/Y	+GRN
=							
=							
=							
=							

PREPARED BY: DLZ DATE: 09/09/22

☐ MDOT ☐ County ☐ City ☒ Consultant

LOCATION:
Fuller & Maiden/EMCD

CONTROL SECTION-SPOT #
126

CLEAR PAGE 2

EPAC Permit 4-2-21

TRAFFIC SIGNAL TIMING PERMIT

	PHASE	1	2	3	4	5	6	7	8			
APPROACH			EB/WB		NB				NB			
MINIMUM GREEN			15		8				8			
PASSAGE			0.0		3.0				3.0			
MAXIMUM NO. 1			99		41				41			
MAXIMUM NO. 2			0		0				0			
YELLOW CHANGE			3.1		3.1				3.0			
RED CLEARANCE			2.5		2.5				2.9			
WALK			8		8							
PEDESTRIAN CLEARANCE			16		12							
EXTENDED PED. CLEARANCE			3		3							
REST IN WALK			1		0							
INITIALIZATION			4		1				1			
NON-ACT RESPONSE			0		0				0			
VEHICLE RECALL			3		0				0			
PEDESTRIAN RECALL			0		0				0			
NON-LOCK MEMORY			0		0				0			
DUAL ENTRY			0		1				1			
	CYCLE									O1	O2	O3
DIAL 1 SPLIT 1	90		55		35				35	65		
DIAL 2 SPLIT 1	120		89		31				31	5		
DIAL 3 SPLIT 1	140		99		41				41	37		
DIAL SPLIT												
DIAL SPLIT												
DIAL SPLIT												
	MODE		1		0				0			

PHASE

1

2 EMCD EB/WB

3

4 Cancer Center NB

5

6

7

8 WMCD NB

Hours of Operation:

D1/S1/O1: Normal
D2/S1/O1: 07:00 to 09:00 Monday-Friday
D3/S1/O1: 14:00 to 17:00 Monday-Friday

OVERLAPS

Overlap Phase	Load Bays	Phases Overlapped	T.G. (s)	Y (s)	R (s)	-G/Y	+GRN
=							
=							
=							
=							

TIMING INSTALLED

REMARKS
This timing plan is for EMCD bridge construction Stage 3.

PREPARED BY: DLZ DATE: 09/09/22

FLASH HOURS: DAILY ☐ NONE ☒ to

NIGHT FLASH:
FY = FR =

CONFLICT FLASH:
FY = FR = All Directions

CONTROLLER TYPE:
☒ EPAC
☐ Other:

PRE-EMPT ☐
COUNTDOWN PEDS ☒

LOCATION:
EMCD at WMCD & Cancer Center
CITY/TWP: Ann Arbor
COUNTY : Washtenaw

MILE POINT
CONTROL SECTION-SPOT #
139

Job # (If Applicable):

Page 3 included only if Pre-Empt Checked

EPAC Permit 4-2-21

ADVANCED TIMING PARAMETERS FORM

SYSTEM INFORMATION

Controller Type:
- [x] EPAC
- [ ] Other:

System Type:
- [ ] Closed Loop
  - [ ] Stand By
  - [ ] Group 1
  - [ ] Group 2
  - Address:
- [x] TBC
- [ ] TBC/GPS
- [ ] None
- [ ] Other:

If TBC, Sync by:
- [x] TOD
- [ ] Event

Interconnect Type:
- [ ] Hardwire
- [ ] Fiber-Optic
- [ ] Radio
- [ ] Cell Modem
- [x] None
- [ ] Other:

If Cell Modem:
Phone #

Controller Status:
- [ ] Primary
- [ ] Secondary
- [ ] Isolated
- [x] TBC

If Secondary,
Primary Location:

Primary
Spot # :

LEFT-TURN PHASING

Phase # / Description	*Permissive-Protected* Lead	*Permissive-Protected* Lag	*Protected-Only* Split	*Protected-Only* Lead	*Protected-Only* Lag
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

RING AND BARRIER STRUCTURE

	B1				B2				B3				B4			
R1	2				4											
R2					8											
R3																
R4																

VEHICULAR AND PEDESTRIAN DETECTION

Approach	Vehicular Detection: Movements and Call Delay (s) Left		Thru		Right		Type: Loop	Video	Other	Pedestrian Detection: Push-Button Crossing Locations
NB (WMCD)	☒		☐		☒		☐	☒	☐	S Leg of EMCD at Cancer Ctr
NB (Cancer Center)	☒		☐		☒		☐	☒	☐	E Leg of EMCD at Cancer Ctr
	☐		☐		☐		☐	☐	☐	S Leg of WMCD at EMCD
	☐		☐		☐		☐	☐	☐	
	☐		☐		☐		☐	☐	☐	
	☐		☐		☐		☐	☐	☐	

DISAPPEARING LEGEND CASE SIGNS

ADDITIONAL DIAL SPLIT DATA

		PHASE	1	2	3	4	5	6	7	8	O1	O2	O3
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											

COORDINATION DATA

Operation Mode	1
Coordination Mode	0
Maximum Mode	0
Correction Mode	3
Offset Mode	0
Force Mode	0
Max Dwell	0
Yield Period	0

REMARKS:

ADDITIONAL OVERLAP DATA

Overlap Phase	*Load Bays*	*Phases Overlapped*	T.G. (s)	Y (s)	R (s)	-G/Y	+GRN
=							
=							
=							
=							

PREPARED BY: DLZ DATE: 09/09/22

☐ MDOT ☐ County ☐ City ☒ Consultant

LOCATION:
EMCD at WMCD & Cancer Center

CONTROL SECTION-SPOT #
139

CLEAR PAGE 2

EPAC Permit 4-2-21

TRAFFIC SIGNAL TIMING PERMIT

	PHASE	1	2	3	4	5	6	7	8			
APPROACH		EB-Left	WB-Thru		NB-Thru	WB-Left	EB-Thru		SB-Thru			
MINIMUM GREEN		5	10		5	5	10		7			
PASSAGE		2.0	0.0		3.0	2.0	0.0		3.0			
MAXIMUM NO. 1		25	45		70	25	45		70			
MAXIMUM NO. 2												
YELLOW CHANGE		3.6	3.6		3.1	3.6	3.6		3.1			
RED CLEARANCE		2.5	2.5		3.3	2.5	2.5		3.3			
WALK			8		7		9		10			
PEDESTRIAN CLEARANCE			17		19		17		14			
EXTENDED PED. CLEARANCE			3		3		3		3			
REST IN WALK			0		0		0		0			
INITIALIZATION		1	4		4	1	4		4			
NON-ACT RESPONSE		0	0		0	0	0		0			
VEHICLE RECALL		2	3		0	2	3		0			
PEDESTRIAN RECALL			0		0		0		0			
NON-LOCK MEMORY		0	0		0	0	0		0			
DUAL ENTRY		0	1		1	0	1		1			
	CYCLE									O1	O2	O3
DIAL 1	SPLIT 1	90	12	35	43	12	35		43	0	0	0
DIAL 2	SPLIT 1	120	22	41	57	23	40		57	0	0	0
DIAL 3	SPLIT 1	140	25	45	70	25	45		70	0		
DIAL	SPLIT											
DIAL	SPLIT											
DIAL	SPLIT											
	MODE	0	1		0	0	1		0			

PHASE

1 Fuller EB-Left
2 Fuller WB-Thru
3 Maiden SB-Left
4 EMCD NB-Thru
5 Fuller WB-Left
6 Fuller EB-Thru
7 EMCD NB-Left
8 Maiden SB-Thru

Hours of Operation:

D1/S1/O1: Normal
D2/S1/O1: 07:00 to 09:00 Monday-Friday
D3/S1/O1: 14:00 to 17:00 Monday-Friday

OVERLAPS

Overlap Phase	*Load Bays*	*Phases Overlapped*	T.G. (s)	Y (s)	R (s)	-G/Y	+GRN
=							
=							
=							
=							

TIMING INSTALLED

REMARKS
This timing plan is for EMCD bridge construction Stage 3.

PREPARED BY: DLZ DATE: 09/09/22

FLASH HOURS:
DAILY ☐ NONE ☒
to

NIGHT FLASH:
FY = FR =

CONFLICT FLASH:
FY = FR = All Directions

CONTROLLER TYPE:
☒ EPAC
☐ Other:

PRE-EMPT ☐
COUNTDOWN PEDS ☒

LOCATION:
Fuller & Maiden/EMCD
CITY/TWP: Ann Arbor
COUNTY : Washtenaw

MILE POINT
CONTROL SECTION-SPOT #
126

Job # (If Applicable):

Page 3 included only if Pre-Empt Checked

EPAC Permit 4-2-21

ADVANCED TIMING PARAMETERS FORM

SYSTEM INFORMATION

Controller Type:
- ☒ EPAC
- ☐ Other:

System Type:
- ☐ Closed Loop
  - ☐ Stand By
  - ☐ Group 1
  - ☐ Group 2
  - Address:
- ☒ TBC
- ☐ TBC/GPS
- ☐ None
- ☐ Other:

If TBC, Sync by:
- ☒ TOD
- ☐ Event

Interconnect Type:
- ☐ Hardwire
- ☐ Fiber-Optic
- ☐ Radio
- ☐ Cell Modem
- ☒ None
- ☐ Other:

If Cell Modem:
Phone #

Controller Status:
- ☐ Primary
- ☐ Secondary
- ☐ Isolated
- ☒ TBC

If Secondary,
Primary Location:

Primary
Spot # :

LEFT-TURN PHASING

Phase # / Description	*Permissive-Protected* Lead	*Permissive-Protected* Lag	*Protected-Only* Split	*Protected-Only* Lead	*Protected-Only* Lag
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

RING AND BARRIER STRUCTURE

	B1				B2				B3				B4			
R1	1	2			4											
R2	5	6			8											
R3																
R4																

VEHICULAR AND PEDESTRIAN DETECTION

Approach	*Vehicular Detection* Movements and Call Delay (s) Left		Thru		Right		Type Loop	Video	Other	*Pedestrian Detection* Push-Button Crossing Locations
NB	☒		☒		☒		☐	☒	☐	All legs
SB	☒		☒		☒		☐	☒	☐	
WB	☒		☒		☒		☐	☒	☐	
EB	☒		☒		☒		☐	☒	☐	
	☐		☐		☐		☐	☐	☐	
	☐		☐		☐		☐	☐	☐	

DISAPPEARING LEGEND CASE SIGNS

ADDITIONAL DIAL SPLIT DATA

		PHASE	1	2	3	4	5	6	7	8	O1	O2	O3
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											
DIAL	SPLIT	CYCLE											

COORDINATION DATA

Operation Mode	1
Coordination Mode	0
Maximum Mode	0
Correction Mode	3
Offset Mode	0
Force Mode	0
Max Dwell	0
Yield Period	0

REMARKS:

ADDITIONAL OVERLAP DATA

Overlap Phase	*Load Bays*	*Phases Overlapped*	T.G. (s)	Y (s)	R (s)	-G/Y	+GRN
=							
=							
=							
=							

PREPARED BY: DLZ DATE: 09/09/22

☐ MDOT ☐ County ☐ City ☒ Consultant

LOCATION:
Fuller & Maiden/EMCD

CONTROL SECTION-SPOT #
126

CLEAR PAGE 2

INNOVATIVE IDEAS
EXCEPTIONAL DESIGN
UNMATCHED CLIENT SERVICE

REPORT
OF
GEOTECHNICAL EXPLORATION

E. Medical Center Drive Bridge Rehabilitation and Widening

Ann Arbor, Michigan

Prepared For:

City of Ann Arbor
301 E. Huron Street
Ann Arbor, Michigan 48104

Prepared By:

DLZ OHIO, INC.

DLZ Job No. 2141-7363.00

October 6, 2023

TABLE OF CONTENTS

APPENDIX A

General Information-Drilling Procedures and Logs of Borings
Legend-Boring Log Terminology
Vicinity Map
Boring Location Plan
Boring Logs (Current Exploration and Historic Borings)
Soil Boring Data Sheets

APPENDIX B

Grain Size Analysis Reports
LOI Test Report
Soil Unconfined Compressive Strength Test Reports
Consolidation Test Report

1.0 INTRODUCTION

The report includes the findings of the subsurface exploration performed for the proposed E. Medical Center Drive bridge rehabilitation in Ann Arbor, Michigan. We understand that the city is proposing to rehabilitate and widen the existing 3-span bridge that carries E. Medical Center Drive over the Norfolk Southern railroad.

The purpose of this exploration was to 1) determine the subsurface conditions to the depths of the borings, 2) evaluate the engineering characteristics of the subsurface materials, and 3) provide information to assist in the design and construction of the proposed work.

The geotechnical exploration presented in this report was performed in accordance with the Agreement for Professional Engineering Services between DLZ Michigan, Inc. (DLZ) and the City of Ann Arbor dated July 6, 2021, and in general accordance with the Michigan Department of Transportation (MDOT) Geotechnical Manual dated November 2019.

The geotechnical engineer has planned and supervised the performance of the geotechnical engineering services, considered the findings, and prepared this report in accordance with generally accepted geotechnical engineering practices. No other warranties, either expressed or implied, are made as to the professional advice included in this report.

2.0 PROJECT DESCRIPTION

The project consists of the rehabilitation of the existing 3-span bridge that is approximately 150 feet in length and carries E. Medical Center Drive over the Norfolk Southern railroad. For the purposes of this report, it is assumed that horizontal and vertical grades associated with the bridge centerline alignment will be essentially unchanged (1 foot or less) from the current conditions at the site. However, we understand that the structure and associated roadway will be widened by approximately 10 feet on the west side. Additionally, we understand that the intent is to re-use the existing pier and abutment foundations with new foundations being utilized for the widened portions of the substructures.

3.0 FIELD INVESTIGATION

The subsurface exploration consisting of drilling a total of nine (9) borings, designated B-01 to B-09, was performed between January 3 and 29, 2022. The borings were drilled to depths ranging from 20 to 60 feet using an ATV-mounted rotary drill rig. The hammer system used was calibrated on May 1, 2020 and had an average drill rod energy efficiency ratio (ER) of 81.0 percent. The borings were advanced between sampling intervals with 3¼ -inch ID Hollow-Stem Augers (HSA). In general, disturbed soil samples were obtained with a 2-inch OD split-barrel sampler in general accordance with ASTM D-1586 (AASHTO T206) at regular intervals of 5 feet or less through the soil overburden. Shelby Tubes soil samples were also collected in some of the borings. Additionally, aggregate base bulk samples were collected just below the pavement at borings B-02 and B-08. The borings were either grouted at completion or backfilled with soil cuttings and bentonite chips. Borings in the road were also patched with cold asphalt patch, with the exception of boring B-03 in the existing bridge deck that was closed off with a steel plate and patched with quick set concrete.

The approximate boring locations drilled during the surface exploration are shown on the boring location plan presented in Appendix A. Boring logs and information concerning the drilling procedures are also presented in Appendix A. The boring locations and ground surface elevations were provided by the DLZ survey team.

Additionally, historic borings were performed in 1981 in the proximity the proposed bridge rehabilitation designated B-2A, B-2B, B-2C, and B-2D. Boring logs for the historic borings are included in Appendix A. It should be noted that the soil descriptions shown on the logs were taken directly from the City of Ann Arbor 1982 plan sheets and are not reflective of the format detailed in the "Legend – Boring Log Terminology" in Appendix A.

4.0 LABORATORY TESTING

The laboratory testing program consisted of visual classifications on all samples in general accordance with the MDOT Geotechnical Manual (i.e. Unified Soil Classification System), and general index tests of selected soil samples. The general index tests consisted of grain-size analyses, moisture content, and plasticity determinations. Specific gravity evaluations were also performed as part of the soil classification.

Consolidation, specific gravity, and/or unconfined compressive strength tests were performed on select Shelby Tube soil samples. Loss on ignition testing (LOI) was performed on a select representative sample suspected of containing organic material and the results are included on the boring logs. Results of the classifications, grain-size analyses, moisture content, plasticity determinations, and unconfined compressive strength tests of soil are shown on the boring logs in Appendix A. Additionally, reports of the LOI testing, consolidation, grain size analyses, specific gravity, and unconfined compressive strength (UCS) testing of soil are included in Appendix B.

5.0 SITE CONDITIONS

The project area is located in Washtenaw County in the city of Ann Arbor, Michigan near the University of Michigan hospital and less than 400 feet south of the Huron River. The site is situated in the Huron-Erie Drift Uplands of Southern Lower Peninsula Hills and Plains. Prior to development, the area was characterized as Erie Lobe end and ground moraines of moderate to high relief, formed on loam and clay loam tills. Topography of the project site lies between approximate elevations 771 and 803 feet mean sea level (MSL).

Soils are identified by the NRCS Soil Survey as being predominantly Boyer loamy sand. The soils are typically well drained with 1 to 6 percent slopes. Bedrock in the area consists of Coldwater Shale, which is Mississippian in age. Water well logs and bedrock mapping suggest that the depth to the top of bedrock in the area is generally greater than 200 feet below the existing ground surface.

A site reconnaissance was performed by a representative of DLZ on December 7, 2021. The roadway along the existing bridge was generally in fair condition with isolated areas of transverse, longitudinal, and edge cracking. The existing E. Medical Center Drive bridge deck is in poor condition, with deteriorated and spalling concrete sections on the bridge deck and cracking on the deck surface. The surrounding area of the project is primarily commercial, with the University of Michigan hospital nearby. Reportedly, water occasionally ponds along the ditches adjacent to the railroad tracks although ponding water was not observed at the time of the site reconnaissance.

6.0 SUBSURFACE CONDITIONS

The following section presents the generalized subsurface conditions encountered by the borings. For more detailed information, please refer to the boring logs presented in the Appendix. Please note that the strata contact lines shown on the boring logs represent approximate boundaries between soil types. In the field, the actual soil transition might be different both vertically and laterally.

6.1 SOILS CONDITIONS

In the current exploration, the borings performed outside the existing roadway encountered approximately 0 to 10 inches of topsoil at the ground surface. The borings performed within the existing roadway pavement generally consisted of 6 to 12 inches of asphalt concrete overlying 2 to 4 inches of granular base, with the exception of boring B-03 which encountered 9 inches of concrete bridge deck and 6 inches of concrete slope protection (at the existing ground surface) approximately 25 feet below the top of the bridge deck. Underlying the surface materials, borings B-01, B-02, B-04, B-06, B-08, and B-09 encountered fill and/or possible to depths ranging from approximately 3.5 to 28.5 feet below the existing ground surface. Underlying the fill and/or possible fill, the overburden soils are predominantly granular soils overlying glacial till deposits. The borings generally consisted of loose to very dense granular soil and very stiff to hard cohesive soil. Additionally, difficult drilling (auger chatter and sand heaving) and cobbles were encountered at various depths throughout the overburden.

It should be noted that a gasoline odor was encountered in boring B-09 between the depths of approximately 6.0 and 8.5 feet below the existing ground surface. Environmental testing is beyond the scope of work for this project.

In the 1981 historic exploration, boring B-2A encountered topsoil at the ground surface to a depth of 1 foot and borings B-2B and B-2C encountered railroad ballast mixed with sand and gravel to depths of 2.8 and 3.5 feet below the existing ground surface, respectively. Below the ground surface and fill materials, the borings generally encountered both granular and cohesive materials to the completion depths of the borings. Additionally, boring B-2D encountered organic material to depth of 7.0 feet, with an asphalt layer in between the layer between the depths of 4.0 and 4.5 feet. It should also be noted that a boulder was encountered in boring B-2A at a depth of 32.5 feet, which caused the boring to be offset before reaching the completion depth in the offset boring.

6.2 GROUNDWATER CONDITIONS

Groundwater seepage was first encountered in the current exploration borings B-01 to B-05, B-07, and B-09 at depths ranging from approximately 6.0 to 43.5 feet below the existing ground surface (between elevations 750.4 and 770.7). At the completion of drilling, water was observed in borings B-01 to B-03 and B-05 at depths ranging from approximately 13.9 to 46.1 feet below the existing ground surface (between elevations 742.0 and 768.5). Where water was added to the augers as part of the drilling process such in boring B-03 due to heaving sands, the water level at completion is not considered as a reliable indication of the groundwater level.

Additionally, in the 1981 historic exploration, soils classified as “wet” were observed in borings B-2A, B-2B, B-2C, and B-2D beginning at depths ranging from 7.0 to 23.5 feet below the existing ground surface.

It should be noted that water level measurements were made inside hollow-stem augers, which could have isolated seepage from seams inside the borings. Additionally, groundwater levels may fluctuate with seasonal variations and following periods of heavy or prolonged precipitation. Therefore, the readings indicated on the boring logs may not be representative of the long-term groundwater level. Long-term monitoring would be needed to obtain a more accurate estimate of the groundwater table elevation.

7.0 DESIGN ANALYSES AND RECOMMENDATIONS

7.1 GENERAL INFORMATION

The project consists of the rehabilitation of the existing 3-span bridge that is approximately 150 feet in length and carries E. Medical Center Drive over the Norfolk Southern railroad. For the purposes of this report, it is assumed that horizontal and vertical grades associated with the bridge centerline alignment will be essentially unchanged (1 foot or less) from the current conditions at the site. However, we understand that the structure and associated roadway will be widened by approximately 10 feet on the west side. Additionally, we understand that the intent is to re-use the existing pier and abutment foundations with new foundations being utilized for the widened portions of the substructures. Furthermore, the existing bench between pier “2” and abutment “B” is being widened to allow for a future bike path and a permanent sheet pile retaining wall is being utilized to facilitate the widening.

Based upon the subsurface conditions in the borings, the site is considered suitable for support of the proposed bridge rehabilitation provided the recommendations in this report are followed. Geotechnical issues encountered during the current exploration that may impact design and construction include relatively shallow groundwater conditions near the railroad trench and cobbles and/or boulders throughout the overburden soils. Additionally, a boulder was encountered in historic boring B-2A (location of historic Abutment “B”) from the 1981 field exploration. These issues are further discussed in the following sections of the report and associated recommendations provided. The recommendations provided in this report are based on the design information provided to DLZ. If any changes to the design are made, DLZ should be notified so that the following recommendations can be reviewed and updated as necessary.

7.2 ROADWAY RECOMMENDATIONS

The subsurface conditions encountered at the site are considered suitable for the design and construction of the roadway. The subgrade conditions encountered near the proposed roadway are shown on the individual boring logs in Appendix A. No information is available with regard to the proposed approach pavement design. However, assuming the pavement subgrade location is similar to the existing, the subgrade soils in B-02 and B-08 were described as sand with gravel and gravelly sand with silt and cobbles (categorized as the USCS classification SP-SM). A design resilient modulus value of 7,000 psi can be considered for SP-SM material according to Table 6.2 of “Pavement Subgrade MR Design Values for Michigan’s Seasonal Changes” by Baladi, Dawson, and Sessions. The subgrade material according to the borings was SP-SM embankment fill material, but the natural material is generally silty, clayey sand (USCS classification SC-SM). If this natural material is encountered, a design resilient modulus value of 3,500 psi can be considered in accordance with Baladi, Dawson, and Sessions.

7.3 SPILL-THROUGH EMBANKMENTS

Slope stability analysis of the spill-through embankments was performed for the widening at abutment "A" and abutment "B". The embankments were evaluated with slopes of 1.5 horizontal to 1 vertical (1.5H:1V) using Spencer and GLE/Morgenstern-Price Limit Equilibrium (LE) Methods using the software SLIDE2 by Rocscience, Inc. Slope stability analysis for the abutment "A" embankment resulted in a minimum factor of safety (FOS) of 1.13 and 1.10 for end-of-construction/short-term loading and long-term loading, respectively, which fails to meet the minimum FOS of 1.3 at the Strength I Limit State as required by the AASHTO LRFD Bridge Design Specifications, 9th Edition (2020). Therefore, slope stabilization (ground improvement) will be required for the slope to meet FOS criteria for slope stability. Consideration could be given to soil nail stabilization of the abutment "A" slope; however, evaluation and recommendations for stabilization of the slope is beyond the current scope of work. It should be noted that some movement of the slope is required to engage the strength of soil nails as with any passive system. Based upon the available boring information and results of the analyses, it is anticipated that the slope along the existing abutment "A" has a similar FOS for slope stability and should be stabilized to meet the FOS criteria for the safety and aging performance of the bridge. Slope stability analysis for abutment "B" resulted in a minimum FOS of 2.76 and 1.40 for end-of-construction and long-term loading, respectively, which does meet the FOS criteria for slope stability assuming the toe of the slope is supported by the proposed sheet pile retaining for the bench widening. It is understood that soil nail stabilization, to be designed and constructed by the Contractor, will be utilized for the widening (only) at abutment "A" to improve the overall stability of the embankment in this area to meet the stability required by the AASHTO LRFD Bridge Design Specifications.

Due to the negligible amount of new fill anticipated for the widening and since slope stability will be addressed for the widening at abutment "A", settlement is not considered an issue for the spill-through embankments for the widening. The end-of-construction and long-term stability models for abutment "A" and abutment "B" are shown below.

Figure 1: Short Term (End of Construction) Slope Stability Analysis for Abutment “A”

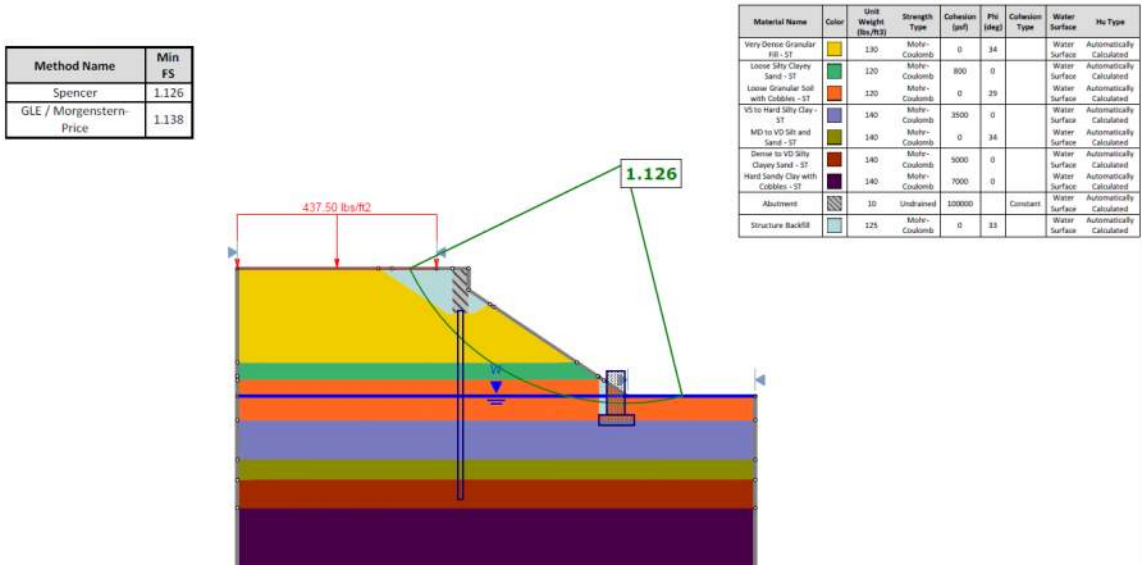


Figure 2: Long Term Stability Slope Stability Analysis for Abutment “A”

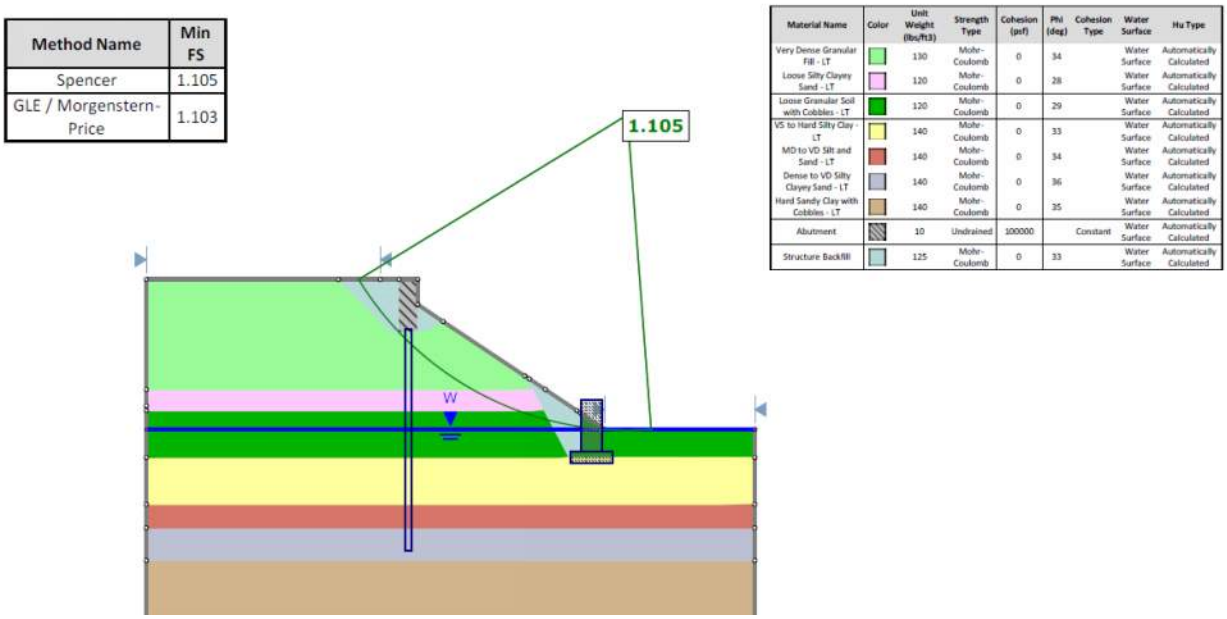
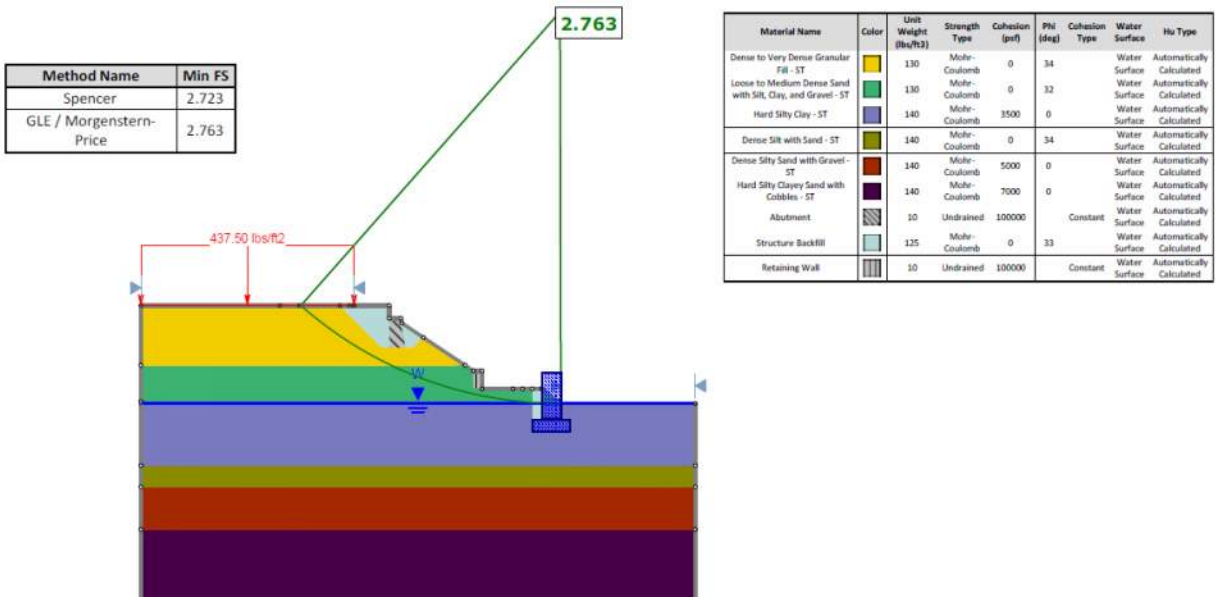


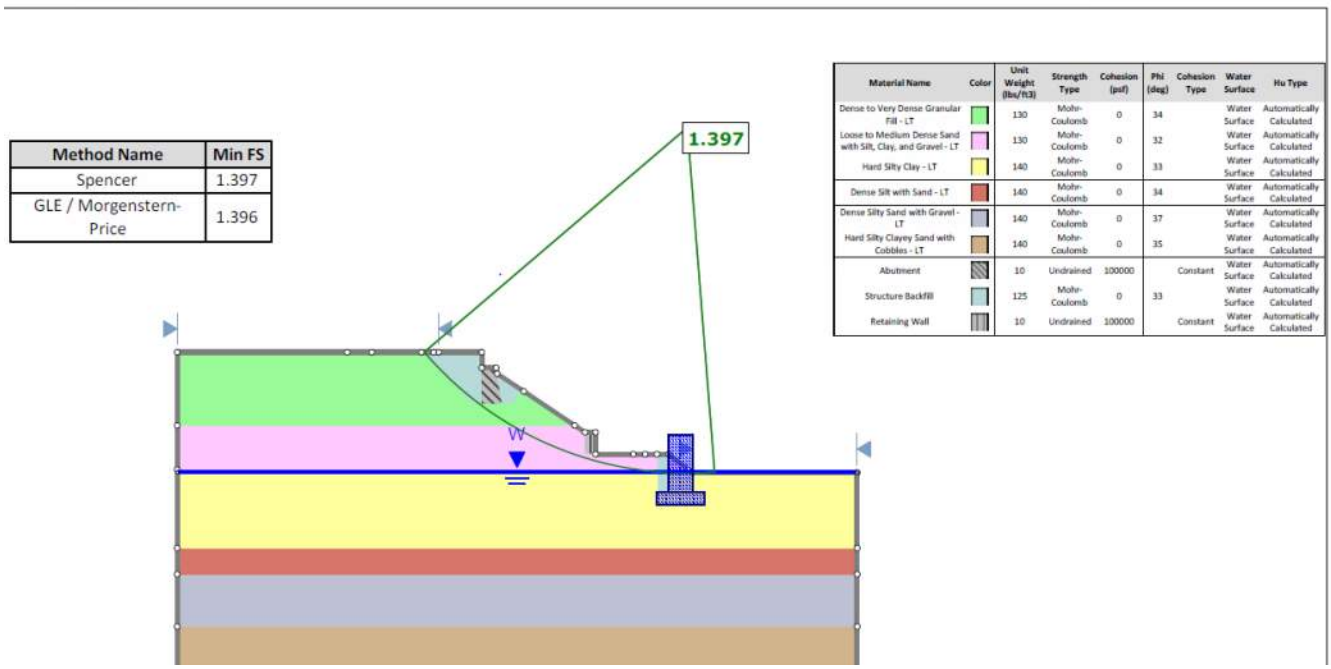
Figure 3: Short Term (End of Construction) Slope Stability Analysis for Abutment "B"



Method Name	Min FS
Spencer	2.723
GLE / Morgenstern-Price	2.763

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Water Surface	Hu Type
Dense to Very Dense Granular Fill - ST		130	Mohr-Coulomb	0	34		Water Surface	Automatically Calculated
Loose to Medium Dense Sand with Silt, Clay, and Gravel - ST		130	Mohr-Coulomb	0	32		Water Surface	Automatically Calculated
Hard Silty Clay - ST		140	Mohr-Coulomb	3500	0		Water Surface	Automatically Calculated
Dense Silt with Sand - ST		140	Mohr-Coulomb	0	34		Water Surface	Automatically Calculated
Dense Silty Sand with Gravel - ST		140	Mohr-Coulomb	5000	0		Water Surface	Automatically Calculated
Hard Silty Clayey Sand with Cobbles - ST		140	Mohr-Coulomb	7000	0		Water Surface	Automatically Calculated
Abutment		10	Undrained	100000		Constant	Water Surface	Automatically Calculated
Structure Backfill		125	Mohr-Coulomb	0	33		Water Surface	Automatically Calculated
Retaining Wall		10	Undrained	100000		Constant	Water Surface	Automatically Calculated

Figure 4: Long Term Stability Slope Stability Analysis for Abutment "B"



Method Name	Min FS
Spencer	1.397
GLE / Morgenstern-Price	1.396

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Water Surface	Hu Type
Dense to Very Dense Granular Fill - LT		130	Mohr-Coulomb	0	34		Water Surface	Automatically Calculated
Loose to Medium Dense Sand with Silt, Clay, and Gravel - LT		130	Mohr-Coulomb	0	32		Water Surface	Automatically Calculated
Hard Silty Clay - LT		140	Mohr-Coulomb	0	33		Water Surface	Automatically Calculated
Dense Silt with Sand - LT		140	Mohr-Coulomb	0	34		Water Surface	Automatically Calculated
Dense Silty Sand with Gravel - LT		140	Mohr-Coulomb	0	37		Water Surface	Automatically Calculated
Hard Silty Clayey Sand with Cobbles - LT		140	Mohr-Coulomb	0	35		Water Surface	Automatically Calculated
Abutment		10	Undrained	100000		Constant	Water Surface	Automatically Calculated
Structure Backfill		125	Mohr-Coulomb	0	33		Water Surface	Automatically Calculated
Retaining Wall		10	Undrained	100000		Constant	Water Surface	Automatically Calculated

7.4 STRUCTURE FOUNDATION RECOMMENDATIONS

Based on the subsurface conditions micropiles are recommended for support of the widening for the bridge substructures. Consideration was given for spread footings for support of the piers; however, settlement was excessive for this option. Additionally, a vibration impact assessment was performed in general accordance with the guidelines provided in the U.S. Federal Transit Administration (FTA) guidance manual, "Transit Noise and Vibration Impact Assessment," Final Report FTA-VA-90-1003-06. From the assessment, it was determined that driven piles could result in excessive vibration for the existing bridge spread foundations and/or "human annoyance" for the nearby university medical center operations. Due to the close proximity of the University Medical Center and considering their operations are highly sensitive to vibrations, it is recommended that vibration monitoring be required for foundation construction, including sheeting/shoring/cofferdam construction.

Micropiles

Table 1 below shows the recommended parameters for micropile foundation design. Verification and proof testing in accordance with the MDOT micropile special provisions are required during construction for the resistance factor assumed in Table 1. A minimum of one verification test should be specified and proof testing on a minimum (1) micropile per substructure.

Table 1 – Micropile Analysis Summary

Design Parameter	Abutment A	Pier 1	Pier 2	Abutment B
Minimum Micropile Bond Zone Diameter (in.)	7.0	7.0	7.0	7.0
Minimum Casing Outside Diameter – Min Thickness (in.)	7.000 x 0.498	7.000 x 0.498	7.000 x 0.498	7.000 x 0.498
Reinforcing Bar Diameter	No. 14	No. 14	No. 14	No. 14
Bottom of Abutment/Pier Footing Elevation (ft)	790.7	762.8	764.0	782.9
Scour Elevation 100/500-Year (ft)	N/A	N/A	N/A	N/A
Bottom of Permanent Casing Elevation (ft)	778.7	752.8	754.0	770.4
Micropile Tip Elevation (ft)	725.7	722.8	724.0	721.4
Nominal Axial Compression Resistance – R_n (kips)	260	158	158	259
Resistance Factor for Micropiles – ϕ_{stat}	0.70	0.70	0.70	0.70
Factored Nominal Axial Resistance = ϕ_{stat}*R_n (kips)	180	110	110	180
Nominal Horizontal Geotechnical Resistance with 0.5 in. of Deflection (kips)	N/A (Battered)	*	*	N/A (Battered)
Resistance Factor for Horizontal Micropile Resistance	1.00	1.00	1.00	1.00

*See Table 4 and Table 5 for recommended soil parameters for use with Lpile (or Group) software by Ensoft for p-y lateral load analysis of the micropiles at the abutments and piers, respectively, as needed.

Cobbles and boulders should be anticipated during micropile installation. No micropile should be terminated on a cobble or boulder.

Retaining Wall

It should be noted that a proposed permanent sheet pile retaining wall is expected to be constructed at the bottom of the slope adjacent to the bike path near abutment "B" to help facilitate widening the bench. The design of the retaining wall was performed by others. However, recommendations for lateral earth pressures are provided in the following section (7.5). The location of the wall should be coordinated with the existing bridge piling. Pile points should be required for the sheeting and cobbles/boulders anticipated during driving.

7.5 LATERAL EARTH PRESSURES

Below-grade structures and excavations should be designed to resist lateral loads imposed by the soil, groundwater, adjacent backslopes, and the surcharge effect of adjacent structures, materials, equipment, and applicable live loads (AASHTO Table 3.11.6.4-1) and the adjacent railroad line. For rigid structures, the lateral earth pressures may be calculated using the "at-rest" condition. For structures that can deflect, the lateral earth pressures should be calculated using the "active" condition. The amount of movement necessary to develop the "active" condition is typically 0.1 to 0.4 percent of the wall height.

In addition to the rigidity of the structure, the magnitudes of the lateral earth pressures are dependent on the type of backfill material, the compactive effort used to place the backfill, and the width of the backfilled zone from the structure compared to the height of the structure. Cohesive soils and granular soils containing significant clay content can result in high lateral pressures. Therefore, it is generally recommended that these materials not be used to backfill against below-grade structures. Sand and gravel granular material should typically be used for backfill. In addition, extensive compaction of any backfill against a rigid structure can also result in large lateral pressures. Consequently, the backfill material within a few feet structures should be placed in thin lifts and compacted with hand-operated compaction equipment to 95± percent of the maximum dry density as determined from ASTM D 698 (Standard Proctor).

Recommended design soil parameters for evaluating lateral earth pressures on the proposed foundation and retaining wall elements are provided in Tables 2 and 3 below. Recommended soil parameters for lateral load analysis using the p-y method with Lpile software by Ensoft are provided in Tables 4 and 5.

Table 2 – Design Soil Parameters – Abutments

Soil Layer Description	Elevation	Layer Thickness, ft	Average N_{60} Value	Average $N1_{60}$ Value	Effective Friction Angle (ϕ'), degrees	Effective Cohesion (c'), psf	Undrained Strength (Su), psf	Total Unit Weight (γ), pcf	Effective Unit Weight below GWT (γ'), pcf	At Rest Pressure Coefficient (Ko)	Active Pressure Coefficient (Ka)	Passive Pressure Coefficient (Kp)
Proposed Backfill Structure, CIP					33	0	NA	125	NA	0.46	0.29	3.39
Abutment A – Existing Soils/Fill (Based on B-01 plus B-03 for bottom layer), Footing at Approximately 790.7 ft												
Very Dense Sand and Gravel with Cobbles (FILL)	>778.8	23.5	>50	>50	34	0	NA	130	NA	0.44	0.28	3.54
Loose Silty, Clayey Sand	773.8-778.8	5	7	6	28	0	800	120	NA	0.53	0.36	2.77
Loose Gravel with Cobbles	763.8-773.8	10	4 (50/4 on sample S-7 with cobbles)	3 (50/4 on sample S-7 with cobbles)	29	0	NA	120	57.6	0.52	0.35	2.88
Hard Silty Clay with Sand	753.8-763.8	10	35	25	33	0	4000	140	77.6	0.46	0.29	3.39
Very Dense Gray Saturated Silt with Sand, with Cobbles	748.8-753.8	5	49	39	34	0	5000	140	77.6	0.44	0.28	3.54
Dense to Very Dense Silty Clayey Sand and Gravel with	741-748.8	7.5	62	40	37	0	NA	140	77.6	0.40	0.25	4.02
Hard Sandy Clay with Cobbles	715-741	26	65	52	35	0	7000	140	77.6	0.43	0.27	3.69
Abutment B – Existing Soils/Fill (Based on B-07 plus B-08 for top layer); Footing at Approximately 782.9 ft												
Dense to Very Dense Gravelly Sand w Silt and Cobbles (FILL)	>778.9		49	>50	34	0	NA	130	NA	0.44	0.28	3.54
Loose to MD Sand with Silt, Clay, and Gravel	770.4-778.9	8.5	16	24	32	0	NA	130	NA	0.47	0.31	3.25
Hard Silty Clay with Sand	755.4-770.4	15	33	36	33	0	4000	140	77.6	0.46	0.29	3.39
Dense Silt with Sand	750.4-755.4	5	41	39	34	0	5000	140	77.6	0.44	0.28	3.54
Dense Saturated Silty Sand with Gravel	740.4-750.4	10	50	42	37	0	NA	140	77.6	0.40	0.25	4.02
Hard Silty Clayey Sand and Cobbles	718.9-740.4	21.5	77	57	35	0	7000	140	77.6	0.43	0.27	3.69

Notes:

(1) Soil Layers listed above starting with the "Hard Silty Clay..." to the bottom depth listed [i.e. soils below elevation 763.8 and 770.4 in borings B-01 and B-07, respectively] are considered "GLACIAL TILL" and may be alternatively referenced as thus in the geotechnical analyses

(2) GWT = Ground water table

(3) Do not use undrained strength (Su) in conjunction with effective shear strength parameters (i.e. effective friction angle, ϕ', and/or effective cohesion, c').

(4) Earth pressure coefficients on this page assume no slope. Therefore, these coefficients are not applicable to the spill through slope in front of the abutment.

Table 3 – Design Soil Parameters – Piers

Soil Type/Layer (Depth)	Depth	Elevation	Layer Thickness, ft	Average N_{60} Value	Average $N1_{60}$ Value	Effective Friction Angle (ϕ'), degrees	Effective Cohesion (c'), psf	Undrained Strength (Su), psf	Total Unit Weight (γ), pcf	Effective Unit Weight below GWT (γ'), pcf	At Rest Pressure Coefficient (Ko)	Active Pressure Coefficient (Ka)	Passive Pressure Coefficient (Kp)
Proposed Backfill Structure, CIP						33	0	NA	125	62.6	0.46	0.29	3.39
Pier 1 (Based on B-03)													
Loose Sand and MD to Dense Silty Sand with Gravel (Fill)	0.5'-8.5'	766.2-774.2	8	23	35	33	0	NA	130	67.6	0.46	0.29	3.39
Very Loose Saturated Silty Sand	8.5'-11'	763.7-766.2	2.5	3	4	28	0	NA	120	57.6	0.53	0.36	2.77
VS to Hard Silty Clay with Sand and Cobbles	11'-18.5'	756.2-763.7	7.5	27	32	33	0	3300	140	77.6	0.46	0.29	3.39
MD to Dense Silty Sand	18.5'-23.5'	751.2-756.2	5	27	29	35	0	NA	140	77.6	0.43	0.27	3.69
Dense to VD Silty Clayey Sand with Cobbles	23.5'-33.5'	741.2-751.2	10	45	45	35	0	5000	140	77.6	0.43	0.27	3.69
Hard Sandy Clay with Cobbles	33.5'-60'	714.7-741.2	26.5	65	52	35	0	7000	140	77.6	0.43	0.27	3.69
Pier 2 (Based on B-05)													
MD to Dense Sand with Gravel and Silt	0.8'-6.8'	765.2-771.2	6	37	57	34	0	NA	130	67.6	0.44	0.28	3.54
VS to Hard Clay and Silty Clay with Sand and Cobbles	6.8'-22.0'	750-765.2	15.2	30	34	33	0	3300	140	77.6	0.46	0.29	3.39
MD to Dense Saturated Silty Sand	22.0'-33.5'	738.5-750	11.5	29	28	35	0	NA	140	77.6	0.43	0.27	3.69
Dense to VD Silty Clayey Sand with Cobbles	33.5'-60'	712-738.5	26.5	64	50	35	0	7000	140	77.6	0.43	0.27	3.69

Notes:

(1) Soil Layers listed above starting with the "VS to Hard Silty Clay..." to the bottom depth listed [i.e. soils below elevation 763.7 and 765.2 in borings B-03 and B-05, respectively] are considered "GLACIAL TILL" and may be alternatively referenced as thus in the geotechnical analyses

(2) GWT = Ground water table. Do not use total unit weight below GWT for effective stress analysis.

(3) For Pier 1, soil layers above the toe of slope, on the "active" (upslope) side use Ka(slope)=Ko(slope)=1.7 x Ko listed in the table above. For example, for Proposed Structure Backfill, Ka(slope) = 1.7 x 0.46 = 0.77

(4) Do not use undrained strength (Su) in conjunction with effective shear strength parameters (i.e. effective friction angle, ϕ', and/or effective cohesion, c').

(5) The passive pressure coefficients assume no slope, considering pier location at bottom of slope, and are not intended for passive resistance of elements above toe of slope.

Table 4 – Lpile Design Parameters – Abutments

						Short Term Loading (Response)					Long Term Loading (Response)		
Soil Layer Description	**Elevation**	**Layer Thickness, ft**	**Average N_{60} Value**	**Average $N1_{60}$ Value**	**Effective Unit Weight (γ'), pcf**	**Lpile Soil Model Recommended**	**Effective Friction Angle (ϕ°), degrees**	**Undrained Strength (Su), psf**	**p-y Modulus (k, lbs/in^3)**	**Strain Factor (ε_{50})**	**Lpile Soil Model Recommended**	**Effective Friction Angle (ϕ°), degrees**	**p-y Modulus (k, lbs/in^3)**
Proposed Backfill Structure, CIP					125	Sand (Reese)	33	NA	90	NA	Sand (Reese)	33	90
Abutment A – Existing Soils/Fill (Based on B-01 plus B-03 for bottom layer), Footing at Approximately 790.7 ft													
Very Dense Sand and Gravel with Cobbles (FILL)	>778.8	23.5	>50	>50	130	Sand (Reese)	34	NA	225	NA	Sand (Reese)	34	225
Loose Silty, Clayey Sand	773.8-778.8	5	7	6	120	Stiff Clay w/o Free Water (Reese)	NA	800	NA	0.008	Sand (Reese)	28	25
Loose Gravel with Cobbles	763.8-773.8	10	4 (50/4 on sample S-7 with cobbles)	3 (50/4 on sample S-7 with cobbles)	57.6	Sand (Reese)	29	NA	20	NA	Sand (Reese)	29	20
Hard Silty Clay with Sand	753.8-763.8	10	35	25	77.6	Stiff Clay w/o Free Water (Reese)	NA	4000	NA	0.005	Sand (Reese)	33	90
Very Dense Gray Saturated Silt with Sand, with Cobbles	748.8-753.8	5	49	39	77.6	Stiff Clay w/o Free Water (Reese)	NA	5000	NA	0.005	Sand (Reese)	34	125
Dense to Very Dense Silty Clayey Sand and Gravel with	741-748.8	7.5	62	40	77.6	Sand (Reese)	37	NA	125	NA	Sand (Reese)	37	125
Hard Sandy Clay with Cobbles	715-741	26	65	52	77.6	Stiff Clay w/o Free Water (Reese)	NA	7000	NA	0.004	Sand (Reese)	35	125
Abutment B – Existing Soils/Fill (Based on B-07 plus B-08 for top layer); Footing at Approximately 782.9 ft													
Dense to Very Dense Gravelly Sand w Silt and Cobbles (FILL)	>778.9		49	>50	130	Sand (Reese)	34	NA	225	NA	Sand (Reese)	34	225
Loose to MD Sand with Silt, Clay, and Gravel	770.4-778.9	8.5	16	24	130	Sand (Reese)	32	NA	60	NA	Sand (Reese)	32	60
Hard Silty Clay with Sand	755.4-770.4	15	33	36	77.6	Stiff Clay w/o Free Water (Reese)	NA	4000	NA	0.005	Sand (Reese)	33	90
Dense Silt with Sand	750.4-755.4	5	41	39	77.6	Stiff Clay w/o Free Water (Reese)	NA	5000	NA	0.005	Sand (Reese)	34	125
Dense Saturated Silty Sand with Gravel	740.4-750.4	10	50	42	77.6	Sand (Reese)	37	NA	125	NA	Sand (Reese)	37	125
Hard Silty Clayey Sand and Cobbles	718.9-740.4	21.5	77	57	77.6	Stiff Clay w/o Free Water (Reese)	NA	7000	NA	0.004	Sand (Reese)	35	125

Notes:

(1) Soil Layers listed above starting with the "Hard Silty Clay..." to the bottom depth listed (i.e. soils below elevation 763.8 and 770.4 in borings B-01 and B-07, respectively) are considered "GLACIAL TILL" and may be alternatively referenced as thus in the geotechnical analyses

(2) See Article 10.7.2.4 of the AASHTO LRFD BDS, 9th Ed for guidance on p-multiplier for pile group effect to lateral loading. Assuming single row of piles (in the direction of loading) with CTC spacing ≥ 5B, Pm=1.0. For sloping ground in passive zone in front of piles, and assuming piles extend below the toe of slope, apply correction factor of 0.33 to Pm within soil depth range above toe of slope for 1.5H:1V slope (i.e. corrected Pm = 0.33 x 1.0 = 0.33).

(3) Do not use undrained strength (Su) in conjunction with effective shear strength parameters (i.e. effective friction angle, ϕ').

Table 5 – Lpile Design Parameters – Piers

						Short Term Loading (Response)					Long Term Loading (Response)		
Soil Type/Layer (Depth)	Elevation	Layer Thickness, ft	Average N_{60} Value	Average $N1_{60}$ Value	Effective Unit Weight (γ'), pcf	Lpile Soil Model Recommended	Effective Friction Angle (ϕ°), degrees	Undrained Strength (Su), psf	p-y Modulus (k, lbs/in^3)	Strain Factor (ε_{50})	Lpile Soil Model Recommended (Long Term	Effective Friction Angle (ϕ°), degrees	p-y Modulus (k, lbs/in^3)
Proposed Backfill Structure, CIP					62.6	Sand (Reese)	33	NA	60	NA	Sand (Reese)	33	90
Pier 1 (Based on B-03)													
Loose Sand and MD to Dense Silty Sand with Gravel (Fill)	766.2-774.2	8	23	35	67.6	Sand (Reese)	33	NA	60	NA	Sand (Reese)	33	60
Very Loose Saturated Silty Sand	763.7-766.2	2.5	3	4	57.6	Sand (Reese)	28	NA	20	NA	Sand (Reese)	28	20
VS to Hard Silty Clay with Sand and Cobbles	756.2-763.7	7.5	27	32	77.6	Stiff Clay w/o Free Water (Reese)	NA	3300	NA	0.005	Sand (Reese)	33	90
MD to Dense Silty Sand	751.2-756.2	5	27	29	77.6	Sand (Reese)	35	NA	90	NA	Sand (Reese)	35	90
Dense to VD Silty Clayey Sand with Cobbles	741.2-751.2	10	45	45	77.6	Sand (Reese)	35	NA	125	NA	Sand (Reese)	35	125
Hard Sandy Clay with Cobbles	714.7-741.2	26.5	65	52	77.6	Stiff Clay w/o Free Water (Reese)	NA	7000	NA	0.004	Sand (Reese)	35	125
Pier 2 (Based on B-05)													
MD to Dense Sand with Gravel and Silt	765.2-771.2	6	37	57	67.6	Sand (Reese)	34	NA	90	NA	Sand (Reese)	34	90
VS to Hard Clay and Silty Clay with Sand and Cobbles	750-765.2	15.2	30	34	77.6	Stiff Clay w/o Free Water (Reese)	NA	3300	NA	0.005	Sand (Reese)	33	125
MD to Dense Saturated Silty Sand	738.5-750	11.5	29	28	77.6	Sand (Reese)	35	NA	90	NA	Sand (Reese)	35	90
Dense to VD Silty Clayey Sand with Cobbles	712-738.5	26.5	64	50	77.6	Stiff Clay w/o Free Water (Reese)	NA	7000	A	0.004	Sand (Reese)	35	125

Notes:

(1) Soil Layers listed above starting with the "VS to Hard Silty Clay..." to the bottom depth listed [i.e. soils below elevation 763.7 and 765.2 in borings B-03 and B-05, respectively] are considered "GLACIAL TILL" and may be alternatively referenced as thus in the geotechnical analyses

(2) See Article 10.7.2.4 of the AASHTO LRFD BDS, 9th Ed for guidance on p-multiplier for pile group effect to lateral loading. Assuming 2x2 pile group with minimum CTC spacing ≥ 7B, Pm=1.0. For lesser spacing see Table 10.7.2.4-1 AASHTO LRFD BDS, 9th Ed. For sloping ground in passive zone in front of piles, and assuming piles extend below the toe of slope, apply correction factor of 0.33 to Pm within soil depth range above toe of slope for 1.5H:1V slope (For example, for Pm = 1.0 the corrected Pm = 0.33 x 1.0 = 0.33).

(3) Do not use undrained strength (Su) in conjunction with effective shear strength parameters (i.e. effective friction angle, ϕ').

7.6 EXCAVATIONS AND GROUNDWATER CONSIDERATIONS

All excavations should be constructed in accordance with applicable local, state, and federal safety regulations including the current OSHA Excavation and Trench Safety Standards (29 CFR Part 1926). The above information is provided only for general guidance. Under no circumstances should the information provided be interpreted to mean that anyone other than the construction contractor assumes responsibility for construction site safety. The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom.

Groundwater seepage was first encountered in borings B-01 to B-05, B-07, and B-09 at depths ranging from approximately 6.0 to 43.5 feet below the existing ground surface (between elevations 750.4 and 770.7). At the completion of drilling, water was observed in borings B-01 to B-03 and B-05 at depths ranging from approximately 13.9 to 46.1 feet below the existing ground surface (between elevations 742.0 and 768.5). Based on the reported observations of ponded water along the ditches adjacent to the railroad, it is anticipated that groundwater will be near the ditch elevation.

Based on the results of the stability analysis, the existing slopes between the abutment and adjacent pier on the order of 1.5H:1V are marginally stable. Any excavation in these slopes should be fully supported prior to excavation to prevent destabilization of the slope. Excavation support such as sheet piling may be considered; however existing bridge piling and cobbles/boulders may be encountered during installation, and pile points may be needed to protect the sheeting from damage. It is understood that sheet piling will be utilized for support of excavation for the pier excavations.

Caving and sloughing of open excavations should be anticipated due to presence of weak/loose, saturated soils encountered in the soil borings within the anticipated excavation depths of the proposed work near the railroad. Excavations for the pier foundation widening and any other excavations within the zone of influence of the railroad should be fully supported (e.g. sheeting, shoring). Granular zones may also be located at various depths in areas not disclosed by the borings. Therefore, excavations extending below the water table into possible granular deposits and silt layers can result in “quick” conditions and complete loss of soil strength or bottom heave when the confining effect of the overburden is removed, and groundwater is not properly controlled. To prevent this occurrence, areas of proposed excavation should be dewatered, and the water level maintained at least three feet below the bottom of the proposed excavation during construction. The Contractor should also be prepared to deal with groundwater seepage or surface water that may accumulate in the open excavations. Given the shallow groundwater encountered, excavations extending below the water table may see excess inflows of groundwater. The Contractor should consult with a dewatering specialist prior to beginning construction.

The existing soils have poor drainage characteristics and, consequently, will require attention to site grading and maintenance during construction to prevent surface water from flowing into excavations and destabilizing excavation slopes and/or softening exposed subgrade soils.

8.0 CLOSING REMARKS

We appreciate having the opportunity to be of service to you on this project. Please do not hesitate to call if you have any questions concerning this report.

Respectfully submitted,

DLZ

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SEB/HJH/TAH

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APPENDIX A

General Information-Drilling Procedures and Logs of Borings
Legend-Boring Log Terminology
Vicinity Map
Boring Location Plan
Boring Logs (Current Exploration and Historic Borings)
Soil Boring Data Sheets

GENERAL INFORMATION
DRILLING PROCEDURES AND LOGS OF BORINGS

Drilling and sampling were conducted in accordance with procedures generally recognized and accepted as standardized methods of investigation of subsurface conditions concerning geotechnical engineering considerations. Borings were drilled with either a truck-mounted or ATV-mounted drill rig.

Drive split-barrel sampling was performed in 2.5 foot increments at intervals not exceeding 5 feet. In the event the sampler encountered resistance to penetration of 6 inches or less after 50 blows of the drop hammer, the sampling increment was discontinued. Standard penetration data were recorded and one or more representative samples were preserved from each sampling increment.

In borings where rock was cored, NXM or NQ size diamond coring tools were used.

In the laboratory all samples were visually classified by a geotechnical engineer. Moisture contents of representative fine-grained soil samples were determined. A limited number of samples, considered representative of foundation materials present, were selected for performance of grain-size analyses and plasticity characteristics tests. The results of these tests are shown on the boring logs.

The boring logs included in the Appendix have been prepared on the basis of the field record of drilling and sampling, and the results of the laboratory examination and testing of samples. Stratification lines on the boring logs indicating changes in soil stratigraphy represent depths of changes approximated by the driller, by sampling effort and recovery, and by laboratory test results. Actual depths to changes may differ somewhat from the estimated depths, or transitions may occur gradually and not be sharply defined. The boring logs presented in this report therefore contain both factual and interpretative information and are not an exact copy of the field log.

Although it is considered that the borings have disclosed information generally representative of site conditions, it should be expected that between borings conditions may occur which are not precisely represented by any one of the borings. Soil deposition processes and natural geologic forces are such that soil and rock types and conditions may change in short vertical intervals and horizontal distances.

Soil/rock samples will be stored at our laboratory for a period of six months. After this period of time, they will be discarded, unless notified to the contrary by the client.

LEGEND – BORING LOG TERMINOLOGY

*Excludes Historic Boring Logs and Data Sheets

Explanation of each column, progressing from left to right

1. Depth (in feet) – refers to distance below the ground surface.

2. Elevation (in feet) – is referenced to mean sea level, unless otherwise noted.

3. Standard Penetration (N) – the number of blows required to drive a 2-inch O.D., 1-3/8 inch I.D., split-barrel sampler, using a 140-pound hammer with a 30-inch free fall. The blows are recorded in 6-inch drive increments. Standard penetration resistance is determined from the total number of blows required for one foot of penetration by summing the second and third 6-inch increments of an 18-inch drive.

   50/n – indicates number of blows (50) to drive a split-barrel sampler a certain number of inches (n) other than the normal 6-inch increment.

4. The length of the sampler drive is indicated graphically by horizontal lines across the "Standard Penetration" and "Recovery" columns.

5. Sample recovery from each drive is indicated numerically in the column headed "Recovery".

6. The drive sample location is designated by the heavy vertical bar in the "Sample No., Drive" column.

7. The length of hydraulically pressed "Undisturbed" samples is indicated graphically by horizontal lines across the "Press" column.

8. Sample numbers are designated consecutively, increasing in depth.

9. Soil Description

   a. The following terms are used to describe the relative compactness and consistency of soils:

   Granular Soils – Compactness

Term	Blows/Foot Standard Penetration
Very Loose	0 – 4
Loose	4 – 10
Medium Dense	10 – 30
Dense	30 – 50
Very Dense	over 50

   Cohesive Soils – Consistency

Term	Unconfined Compression tons/sq.ft.	Blows/Foot Standard Penetration	Hand Manipulation
Very Soft	less than 0.25	below 2	Easily penetrated by fist
Soft	0.25 – 0.50	2 – 4	Easily penetrated by thumb
Medium Stiff	0.50 – 1.0	4 – 8	Penetrated by thumb with moderate pressure
Stiff	1.0 – 2.0	8 – 15	Readily indented by thumb but not penetrated
Very Stiff	2.0 – 4.0	15 – 30	Readily indented by thumb nail
Hard	over 4.0	over 30	Indented with difficulty by thumb nail

   b. Color – If a soil is a uniform color throughout, the term is single, modified by such adjective as light and dark. If the predominant color is shaded by a secondary color, the secondary color precedes the primary color. If two major and distinct colors are swirled throughout the soil, the colors are modified by the term "mottled".

   c. Texture is based on the Unified Classification System. Soil particle size definitions are as follows:

Description		Size	Description		Size
Boulders		Larger than 8"	Sand	– Coarse	4.76 mm to 2.0 mm
Cobbles		8" to 3"		– Medium	2.0 mm to 0.42 mm
Gravel	– Coarse	3" to 0.75"		– Fine	0.42 mm to 0.074 mm
	– Fine	0.75" to 0.1875"	Silt		0.074 mm to 0.005 mm
			Clay		smaller than 0.005 mm

d. The main soil component is listed first. The minor components are listed in order of decreasing percentage of particle size.

e. Modifiers to main soil descriptions are indicated as a percentage by weight of particle sizes.

trace	0 to 10%
little	10 to 20%
some	20 to 35%
"and"	35 to 50%

f. Moisture content of **cohesionless soils** (sands and gravels) is described as follows:

Term	Relative Moisture or Appearance
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Saturated	Visible free water

g. The moisture content of **cohesive soils** (silts and clays) is expressed relative to plastic properties.

Term	Relative Moisture or Appearance
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Saturated	Visible free water

10. Rock Hardness and Rock Quality Designation

a. The following terms are used to describe the relative hardness of the **bedrock**.

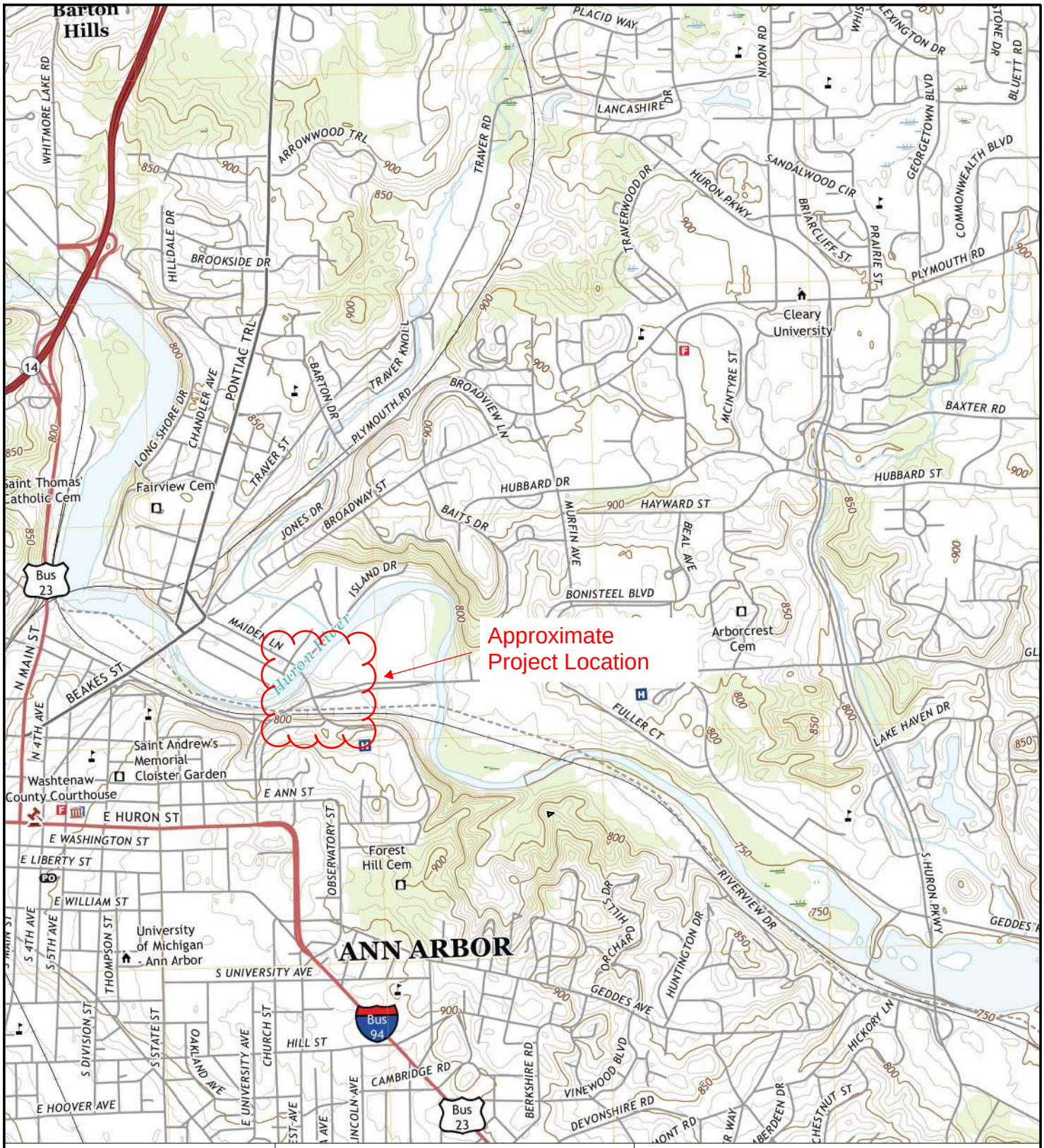
Term	Definition
Very Weak Rock	Can be peeled by pocket knife
Weak Rock	Can be peeled with difficulty by pocket knife
Medium Strong Rock	Can be indented 3/16 inch with sharp end of pick
Strong Rock	Requires one blow of geologist's hammer to fracture
Very Strong Rock	Requires many blows of geologist's hammer to fracture
Extremely Strong Rock	Can only be chipped with blows by geologist's hammer

b. Rock Quality Designation, RQD – This value is expressed in percent and is an indirect measure of rock soundness. It is obtained by summing the total length of all core pieces which are at least four inches long, and then dividing this sum by the total length of the core run.

11. Gradation – when tests are performed, the percentage of each particle size is listed in the appropriate column (defined in Item 9c).

12. When a test is performed to determine the natural moisture content, liquid limit moisture content, or plastic limit moisture content, the moisture content is indicated graphically.

13. The standard penetration (N) value in blows per foot is indicated graphically.



E. Medical Center Drive
Bridge Rehabilitation
City of Ann Arbor,
Michigan

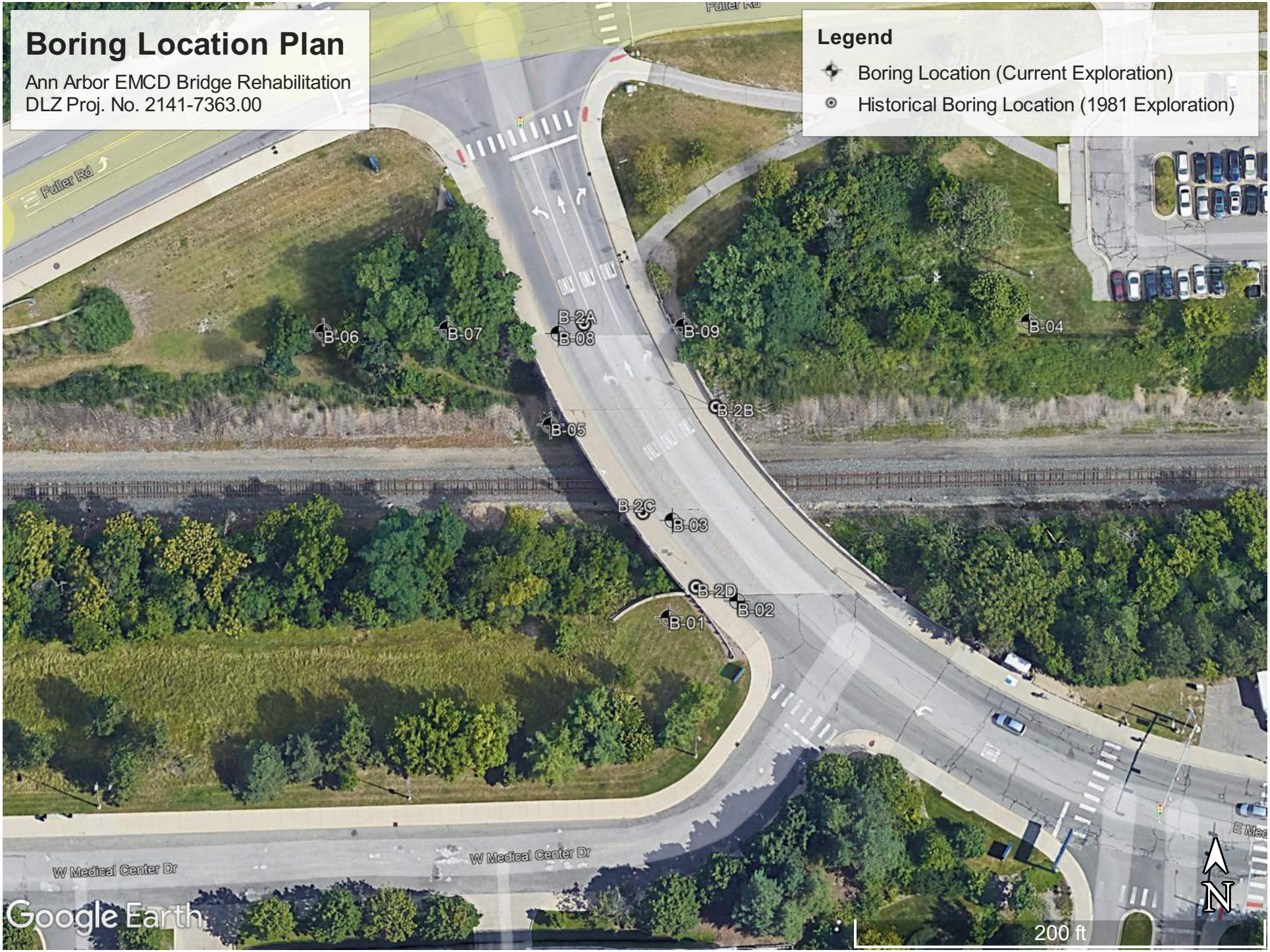
USGS TOPOGRAPHIC MAP:
7.5-MINUTE MAP FOR ANN ARBOR EAST, MI 2019

PROJECT LOCATION MAP

EMCD Bridge Rehabilitation
City of Ann Arbor, Michigan

DLZ PROJECT NUMBER	2141-7363.00
DRAWN BY (DATE)	SEB (7/15/2022)
CHECKED BY (DATE)	HJH (7/18/2022)
SCALE	GRAPHIC

DLZ OHIO, INC.
6121 HUNTLEY RD
COLUMBUS, OH 43229
OFFICE: (614) 888-0040
WWW.DLZ.COM


Boring Location Plan
Ann Arbor EMCD Bridge Rehabilitation
DLZ Proj. No. 2141-7363.00
Legend
Boring Location (Current Exploration)
Historical Boring Location (1981 Exploration)
Fuller Rd
B-06
B-07
B-2A
B-08
B-09
B-04
B-2B
B-05
B-2C
B-03
B-2D
B-02
B-01
W Medical Center Dr
W Medical Center Dr
Google Earth
200 ft
N

DLZ Ohio, Inc. * 6121 Huntley Road, Columbus, Ohio 43229 * (614) 888-0040

Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-01 | *Location:* As per plan | *Date Drilled:* 1/16/2022

Rig (#) / ER: CME 750X (289498) / 81.0% | *Driller:* TZ | *Logger:* AM

WATER OBSERVATIONS:
Water seepage at: 43.5
Water level at completion: 46.1

DRILLING METHODS - 3 1/4" HS Augers
ABANDONMENT - bentonite-cement grout

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	Natural Moisture Content, % / PL / LL / N_{60} Value
	802.3						Very Dense, Brown, Moist, SAND with Gravel (FILL) and Cobbles.								
		14 50/4		S-1			@4', Slight Scraping								50+
8.5	793.8														
		10 12 26		S-2			Very Dense, Brown and Dark Brown, Moist, Silty SAND with Gravel and Cobbles (FILL). @8.5'-10.0', Contains Brick Fragments								51
		22 16 18		S-3					22	8	19	29	--22--		
		20 31 45		S-4			@18.5', Occasional Auger Chatter								103
23.5	778.8						@22.5', Auger Chatter								
		4 3 2		S-5			Loose, Brown, Moist, Silty, Clayey SAND.		7	2	13	30	33	15	
25	777.3														

DLZ Ohio, Inc. * 6121 Huntley Road, Columbus, Ohio 43229 * (614) 888-0040

Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-01 | *Location:* As per plan | *Date Drilled:* 1/16/2022

Rig (#) / ER: CME 750X (289498) / 81.0% | *Driller:* TZ | *Logger:* AM

WATER OBSERVATIONS:
Water seepage at: 43.5
Water level at completion: 46.1

DRILLING METHODS - 3 1/4" HS Augers
ABANDONMENT - bentonite-cement grout

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
	777.3													
							Loose, Brown, Moist, Silty, Clayey SAND. (continued)							
28.5	773.8													
		5 3 3		S-6			Loose, Brown, Moist, GRAVEL.							
33.5	768.8													
		50/4		S-7			Very Dense, Brown, Moist, GRAVEL with Sand and Cobbles.							
38.5	763.8						@37.5', Heavy Auger Chatter							
		8 12 15		S-8		4.5+	Hard, Gray, Moist, SILTY CLAY with Sand.		1	1	2	19	53	24
		6 10 15		S-9		4.25								
48.5	753.8													
50	752.3	8 18 25		S-10			Very Dense, Gray, Saturated, SILT with Sand and Cobbles.		0	0	2	24	63	11

Natural Moisture Content, % -
PL N_{60} Value ○ LL / Non-Plastic - NP
10 20 30 40
50+

Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-01 | *Location:* As per plan | *Date Drilled:* 1/16/2022

Rig (#) / ER CME 750X (289498) / 81.0% | *Driller* TZ | *Logger* AM

WATER OBSERVATIONS:
Water seepage at: 43.5
Water level at completion: 46.1

DRILLING METHODS - 3 1/4" HS Augers
ABANDONMENT - bentonite-cement grout

Depth (ft)	Elev. (ft) 752.3	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	Natural Moisture Content, % - ● PL N_{60} Value ○ LL / Non-Plastic - NP (10 20 30 40)
							Very Dense, Gray, Saturated, SILT with Sand and Cobbles. (continued)								
53.5	748.8						@52.5', Auger Chatter								
55		11 13 20		S-11			Dense, Brownish Gray, Saturated, Silty, Clayey SAND with Gravel.								
58.5	743.8														
60.0	742.3	8 26 33		S-12			Very Dense, Brown and Gray, Saturated, GRAVEL with Sand and Silt.								80
							Bottom of Boring - 60.0'								
65															
70															
75															

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Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-02 | *Location:* As per plan | *Date Drilled:* 1/15/2022

Rig (#) / ER CME 750X (289498) / 81.0% | *Driller* TZ | *Logger* AM

Natural Moisture Content, % - ●

PL N_{60} Value ○ 10 20 30 40 LL / Non-Plastic - NP

WATER OBSERVATIONS:
Water seepage at: 33.5
Water level at completion: 33.2

DRILLING METHODS - 3 1/4" HS Augers
ABANDONMENT - bentonite-cement grout; asphalt patch at surface

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	Natural Moisture Content, % - ●
	801.7														
1.3	800.4						Asphalt - 12" Granular Base - 2-3"								
		16 21 39	18	S-1			Dense to Very Dense, Brown, Moist, SAND with Gravel (FILL).								81 ○
		3 13 16	15	S-2											
6.0	795.7														
		6 8 14	17	S-3			Medium Dense to Dense, Brown, Moist, Gravelly SAND with Silt (FILL).								●
		5 6 9	18	S-4					37	17	25	12	--9--		● ○
		9 12 16	18	S-5											○
		9 15 17	16	S-6											○
16.0	785.7														
		18 33 39	18	S-7			Very Dense, Brown, Moist, SAND with Gravel and Silt; Contains Black and Gray Rock Fragments and Cobbles (FILL). @17.5', Auger Chatter								97 ○
		15 24 26	14	S-8											68 ○
21.0	780.7						@20', Auger Chatter and Cobbles.								
		10 15 27	18	S-9			Medium Dense to Very Dense, Brown, Moist, Gravelly SAND with Silt and Cobbles (POSSIBLE FILL).		39	10	26	14	9	2	● 57 ○
		9 10 7	18	S-10											○
25	776.7														

DLZ Ohio, Inc. * 6121 Huntley Road, Columbus, Ohio 43229 * (614) 888-0040

Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-02 | *Location:* As per plan | *Date Drilled:* 1/15/2022

Rig (#) / ER: CME 750X (289498) / 81.0% | *Driller:* TZ | *Logger:* AM

WATER OBSERVATIONS:
Water seepage at: 33.5
Water level at completion: 33.2

DRILLING METHODS - 3 1/4" HS Augers
ABANDONMENT - bentonite-cement grout; asphalt patch at surface

Depth (ft)	Elev. (ft) 776.7	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	Natural Moisture Content, % - ● PL N_{60} Value ○ LL / Non-Plastic - NP (10 20 30 40)
		9 12 15	18	S-11			Medium Dense to Very Dense, Brown, Moist, Gravelly SAND with Silt and Cobbles (POSSIBLE FILL). (continued)								
28.5	773.2														
		25 24 18	18	S-12			Very Dense, Light Brown, Moist, SAND with Gravel, Silt, and Cobbles.								57
30							@31', Auger Chatter ▼								
33.5	768.2														
		16 19 24	18	S-13			Very Dense, Brown, Saturated, GRAVEL with Sand and Silt.								58
35.0	766.7						Bottom of Boring - 35.0'								
40															
45															
50															

DLZ Ohio, Inc. * 6121 Huntley Road, Columbus, Ohio 43229 * (614) 888-0040

Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

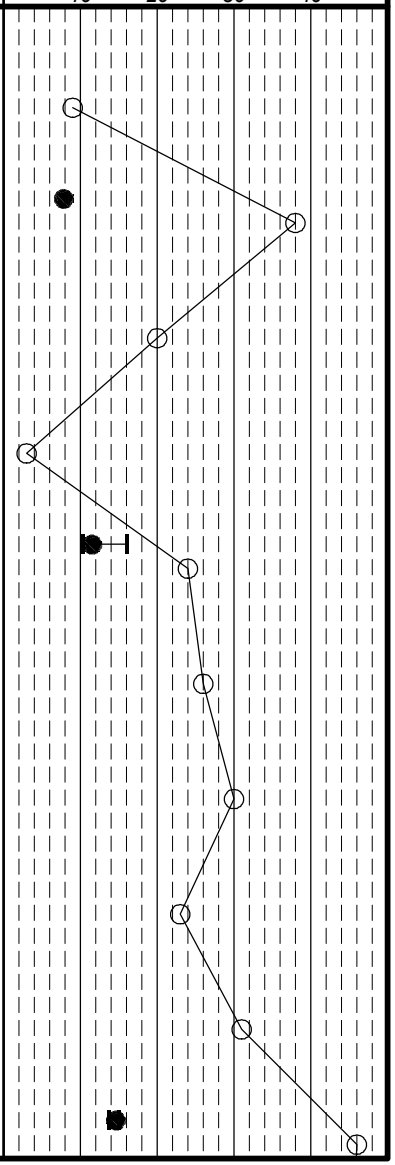
LOG OF: Boring B-03 | *Location:* As per plan | *Date Drilled:* 1/29/2022

Rig (#) / ER CME 750X (289498) / 81.0% | *Driller* TZ | *Logger* AM

WATER OBSERVATIONS:
Water seepage at: 8.5
Water level at completion: 13.9' (11.0' Prior to Adding Water)

DRILLING METHODS - 3 1/4" HS Augers
ABANDONMENT - bentonite-cement grout; concrete at surface and deck

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
	774.7													
0.5	774.2						Concrete Slope Protection - 6"							
		3 3 4	2	S-1			Loose, Brown, Moist, SAND with Gravel.							
3.5	771.2													
5		8 13 15	13	S-2			Medium Dense to Dense, Brown, Moist, Silty SAND with Gravel.		20	11	27	14	21	7
		8 9 6	15	S-3			@6.0'-7.5', Contains Stone Fragments							
8.5	766.2													
10		3 1 1	6	S-4			Very Loose, Brown and Dark Brown, Saturated, Silty SAND with Gravel.							
11.0	763.7													
		5 8 10	18	S-5		4.5	Very Stiff to Hard, Gray, Moist, SILTY CLAY with Sand and Cobbles.		1	1	2	17	52	27
15		5 8 11	18	S-6		4.5	@15', Auger Chatter							
		8 9 13	18	S-7		3.25								
18.5	756.2													
20		8 8 9	18	S-8			Medium Dense to Dense, Gray, Moist to Saturated, Silty SAND.							
		7 9 14	18	S-9			@21', 3' Sand Heave.							
23.5	751.2						@23.5', 3' Sand Heave							
25	749.7	10 15 19	18	S-10			Dense to Very Dense, Gray and Brownish Gray, Moist to Saturated, Silty, Clayey SAND and Cobbles.		2	2	11	38	33	14



Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-03 | *Location:* As per plan | *Date Drilled:* 1/29/2022

Rig (#) / ER CME 750X (289498) / 81.0% | *Driller* TZ | *Logger* AM

WATER OBSERVATIONS:
Water seepage at: 8.5
Water level at completion: 13.9' (11.0' Prior to Adding Water)

DRILLING METHODS - 3 1/4" HS Augers
ABANDONMENT - bentonite-cement grout; concrete at surface and deck

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	Natural Moisture Content, % - ● PL N_{60} Value ○ LL / Non-Plastic - NP
	749.7														
		9 12 21	18	S-11			Dense to Very Dense, Gray and Brownish Gray, Moist to Saturated, Silty, Clayey SAND and Cobbles. (continued)								
		10 15 50/3	12	S-12											50+
30							@30'-35', Very Heavy Auger Chatter and Difficult Drilling (Advanced Several Inches per Minute)								
33.5	741.2														
		10 18 20	18	S-13		4.5+	Hard, Brownish Gray and Gray, Moist, Sandy CLAY and Cobbles.								51
35							@35'-45', Difficult Drilling								
		11 20 29	18	S-14		4.5									66
40															
		12 17 24	18	S-15		4.5			2	3	11	34	27	23	55
45															
		15 23 28	18	S-16		4.5									69
50	724.7														

Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-03 | *Location:* As per plan | *Date Drilled:* 1/29/2022

Rig (#) / ER CME 750X (289498) / 81.0% | *Driller* TZ | *Logger* AM

WATER OBSERVATIONS:
Water seepage at: 8.5
Water level at completion: 13.9' (11.0' Prior to Adding Water)

DRILLING METHODS - 3 1/4" HS Augers
ABANDONMENT - bentonite-cement grout; concrete at surface and deck

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	Natural Moisture Content, % - ● PL N_{60} Value ○ LL / Non-Plastic - NP (10 20 30 40)
	724.7						Hard, Brownish Gray and Gray, Moist, Sandy CLAY and Cobbles. (continued)								
55		19 20 29	18	S-17		4.5									66 ○
60.0 60	714.7	15 27 33	18	S-18		4.5									81 ○
							Bottom of Boring - 60.0'								
65															
70															
75															

Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-04 | *Location:* As per plan | *Date Drilled:* 1/6/2022

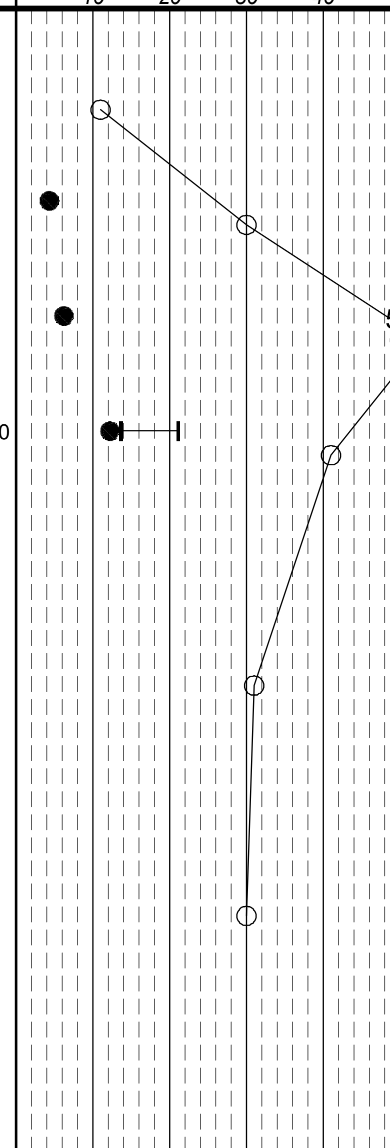
WATER OBSERVATIONS:
Water seepage at: 6
Water level at completion: None Observed

DRILLING METHODS - 3 1/4" HS Augers
ABANDONMENT - backfilled with cuttings

Rig (#) / ER: CME 750X (289498) / 81.0% | *Driller:* TZ | *Logger:* TZ

Depth (ft)	Elev. (ft) 776.7	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
3.5	773.2	3 4 4	13	S-1			Medium Dense, Dark Brown, Moist, Silty SAND; Contains Trace Coal Fragments (FILL).						
6.0	770.7	7 11 11	12	S-2			Medium Dense, Light Brown, Moist SAND with Gravel and Silt.						
8.5	768.2	15 29 10	13	S-3			Very Dense, Brown, Saturated, Gravelly SAND with Silt.	46	13	26	9	--6--	
		10 13 17	18	S-4		4.5+	Hard, Brown, Moist, SILTY CLAY with Sand.	0	1	2	18	49	30
		8 10 13	18	S-5		4.5+	@13.5'-20.0', Gray						
20.0	756.7	7 9 13	18	S-6		4.5+							
							Bottom of Boring - 20.0'						

Natural Moisture Content, % - ●
PL ├──┤ LL
N_{60} Value ○ / Non-Plastic - NP



DLZ Ohio, Inc. * 6121 Huntley Road, Columbus, Ohio 43229 * (614) 888-0040

Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

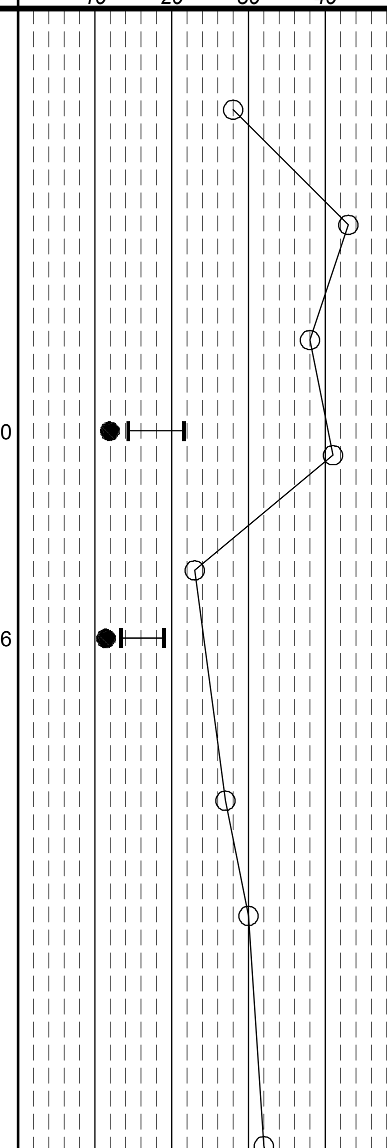
LOG OF: Boring B-05 | *Location:* As per plan | *Date Drilled:* 1/4/2022 to 1/5/2022

WATER OBSERVATIONS:
Water seepage at: 6
Water level at completion: 30

DRILLING METHODS - 3 1/4" HS Augers
ABANDONMENT - bentonite-cement grout

Rig (#) / ER: CME 750X (289498) / 81.0% | *Driller:* TZ | *Logger:* TS

Depth (ft)	Elev. (ft) 772.0	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0.8	771.2						Topsoil - 10"						
		8 10 11	18	S-1			Medium Dense to Dense, Light Brown, Moist, SAND with Gravel and Silt.						
5		6 13 19	18	S-2									
6.8	765.3	19 16 12	18	S-3		4.5+	@6.0', Saturated Sand and Gravel Seam						
							Hard, Brown, Moist CLAY with Sand and Cobbles; Contains Iron Oxide Staining. @8', Auger Chatter and Cobbles						
10		9 13 17	18	S-4		4.5+		1	0	2	17	50	30
11.0	761.0	5 8 9	18	S-5		4.5+	Very Stiff to Hard, Brownish Gray, Moist, SILTY CLAY with Sand.						
			24		ST-1		@12.5'-14.5', UCT = 2.666 TSF	1	0	2	17	54	26
15		7 8 12	18	S-6		4.5+							
20		6 10 12	18	S-7		4.5+							
22.0	750.0		4		ST-2		Medium Dense to Dense, Brown, Saturated, Silty SAND.						
25	747.0	8 14 10	18	S-8									



DLZ Ohio, Inc. * 6121 Huntley Road, Columbus, Ohio 43229 * (614) 888-0040

Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-05 | *Location:* As per plan | *Date Drilled:* 1/4/2022 to 1/5/2022

Rig (#) / ER CME 750X (289498) / 81.0% | *Driller* TZ | *Logger* TS

WATER OBSERVATIONS:
Water seepage at: 6
Water level at completion: 30

DRILLING METHODS - 3 1/4" HS Augers
ABANDONMENT - bentonite-cement grout

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	Natural Moisture Content, % - ● PL N_{60} Value ○ LL / Non-Plastic - NP (10 20 30 40)
	747.0														
		7 13 14	18	S-9			Medium Dense to Dense, Brown, Saturated, Silty SAND. (continued)		4	7	24	39	15	11	
		5 6 8	18	S-10											
30															
33.5	738.5														
		11 14 20	18	S-11		4.5+	Dense to Very Dense, Brown and Brownish Gray, Moist, Silty, Clayey SAND and Cobbles.								
35															
		12 21 28	18	S-12		4.5+									66
40							@40', Auger Chatter/Grinding								
		13 26 29	18	S-13		4.5+			13	4	11	29	24	19	74
45															
		11 19 28	18	S-14		3.25-4.5									63
50	722.0														

Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-05 | *Location:* As per plan | *Date Drilled:* 1/4/2022 to 1/5/2022

Rig (#) / ER CME 750X (289498) / 81.0% | *Driller* TZ | *Logger* TS

WATER OBSERVATIONS:
Water seepage at: 6
Water level at completion: 30

DRILLING METHODS - 3 1/4" HS Augers
ABANDONMENT - bentonite-cement grout

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	Natural Moisture Content, % - ● PL N_{60} Value ○ LL / Non-Plastic - NP (10 20 30 40)
	722.0														
							Dense to Very Dense, Brown and Brownish Gray, Moist, Silty, Clayey SAND and Cobbles. (continued)								
55		18 19 25	18	S-15		4.5+									● 59 ○
58.5	713.5														
60.0	712.0	11 30 26	18	S-16		2.75	Very Stiff, Brownish Gray, Moist, Sandy CLAY; Trace of Gravel.								○ 76
							Bottom of Boring - 60.0'								
65															
70															
75															

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Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-06 | *Location:* As per plan | *Date Drilled:* 1/3/2022

Rig (#) / ER: CME 750X (289498) / 81.0% | *Driller:* TZ | *Logger:* TS

WATER OBSERVATIONS:
Water seepage at: None Observed
Water level at completion: None Observed

DRILLING METHODS - 3 1/4" HS Augers
ABANDONMENT - backfilled with cuttings, topsoil placed at surface

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	Natural Moisture Content, % - N_{60} Value
	782.0														PL 10 20 30 40 LL / Non-Plastic - NP
0.7	781.4						Topsoil - 8"								
		14 12 11	18	S-1			Dense, Dark Brown to Black, Moist, Silty, Clayey SAND with Gravel; Contains Asphalt Odor (FILL).								
3.5	778.5														
5		5 5 6	18	S-2		2.75	Medium Dense, Brown and Dark Brown, Silty, Clayey SAND and Cobbles.		9	2	11	34	25	19	
		11 12 50/2	6	S-3		3.0	@6.0'-7.5', Contains Slight Organic Odor, LOI = 3.84%, Sampler Refusal on Cobble @7'-12', Auger Chatter/Grinding								50+
8.5	773.5														
10		16 18 31	8	S-4			Very Dense, Light Brown, Moist SAND with Gravel and Silt and Cobbles. @8.5', Stone Stuck in Spoon Tip, Possibly Skewed Blow Counts								66
13.5	768.5														
15		5 16 16	18	S-5		4.5+	Very Stiff to Hard, Brown and Gray, Moist, CLAY with Sand.		2	1	2	16	51	28	
20.0	762.0	7 7 10	18	S-6		4.5+									
20							Bottom of Boring - 20.0'								
25															

Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-07 | *Location:* As per plan | *Date Drilled:* 1/5/2022

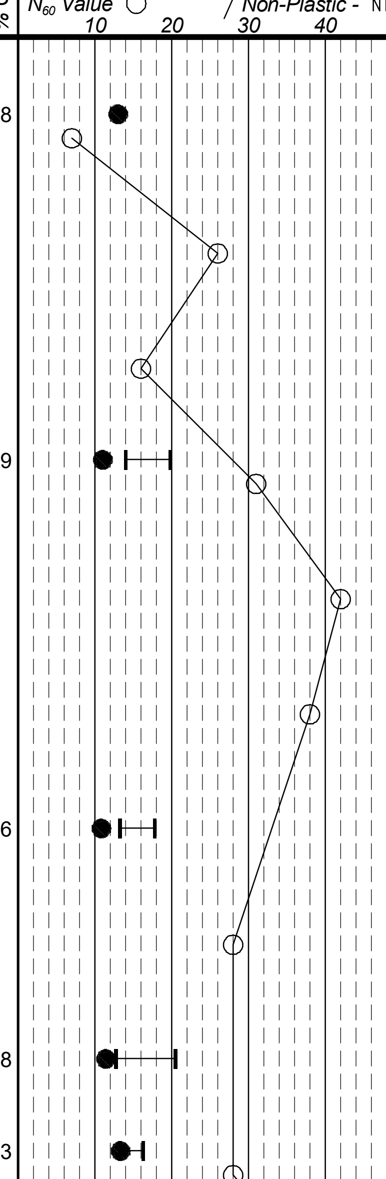
WATER OBSERVATIONS:
Water seepage at: 28.5
Water level at completion: Not Recorded

DRILLING METHODS - 3 1/4" HS Augers
ABANDONMENT - bentonite-cement grout

Rig (#) / ER: CME 750X (289498) / 81.0% | *Driller:* TZ | *Logger:* TZ

Depth (ft)	Elev. (ft) 778.9	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
		2 2 3	14	S-1			Loose, Brown and Dark, Moist, Silty, Clayey SAND; Contains Trace Roots	0	1	5	45	31	18
3.5	775.4	6 8 11	13	S-2			Medium Dense, Brown, Moist, SAND with Gravel and Silt.						
6.0	772.9	3 4 8	10	S-3			Medium Dense, Brown, Moist, Silty SAND with Gravel.						
8.5	770.4	6 10 13	15	S-4		4.5+	Hard, Brown, Moist, SILTY CLAY with Sand; Contains Trace Iron Oxide Staining.	0	1	2	18	50	29
		6 13 18	14	S-5		4.5+							
		6 14 14	13	S-6		4.5+	@13.5'-23.5', Gray						
					ST-1		@16'-18', UCT = 3.584 TSF	1	1	2	20	50	26
		5 9 12	18	S-7		4.5+							
					ST-2			1	1	2	16	52	28
23.5	755.4	6 13 8	18	S-8			Dense, Gray and Brown, Moist SILT with Sand.	1	0	2	23	51	23
25	753.9												

Natural Moisture Content, % - ●
PL ⊢—⊣ LL
N_{60} Value ○ / Non-Plastic - NP



Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-07 | *Location:* As per plan | *Date Drilled:* 1/5/2022

WATER OBSERVATIONS:
Water seepage at: 28.5
Water level at completion: Not Recorded

DRILLING METHODS - 3 1/4" HS Augers
ABANDONMENT - bentonite-cement grout

Rig (#) / ER: CME 750X (289498) / 81.0% | *Driller:* TZ | *Logger:* TZ

Natural Moisture Content, % - ●
PL ○ *LL*
N_{60} *Value* / *Non-Plastic -* NP

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	N60 Value
	753.9														
		4 11 19	18	S-9			Dense, Gray and Brown, Moist SILT with Sand. (continued) ▼								
28.5	750.4														
30		9 15 17	18	S-10			Dense, Brown, Saturated, Silty SAND with Gravel.								
		18 21 14	18	S-11											
38.5	740.4														
40		11 21 29	18	S-12		4.5+	Hard, Grayish brown, Moist, Silty, Clayey SAND and Cobbles.		6	3	10	32	28	21	68
45		11 27 34	18	S-13		4.5+	@43.5'-60.0', Gray								82
50	728.9	19 24 28	18	S-14		4.5+									70

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Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-07 | *Location:* As per plan | *Date Drilled:* 1/5/2022

Rig (#) / ER: CME 750X (289498) / 81.0% | *Driller:* TZ | *Logger:* TZ

WATER OBSERVATIONS:
Water seepage at: 28.5
Water level at completion: Not Recorded

DRILLING METHODS - 3 1/4" HS Augers
ABANDONMENT - bentonite-cement grout

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	Natural Moisture Content, % - ● PL N_{60} Value ○ LL / Non-Plastic - NP (10 20 30 40)
	728.9						Hard, Grayish brown, Moist, Silty, Clayey SAND and Cobbles. (continued)								
55		15 22 29	18	S-15		4.5+									69 ○
60.0 60	718.9	28 30 38	18	S-16		4.5+	@58.5'-60.0', Contains Rock Fragments								92 ○
							Bottom of Boring - 60.0'								
65															
70															
75															

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Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-08 | *Location:* As per plan | *Date Drilled:* 1/15/2022

Rig (#) / ER: CME 750X (289498) / 81.0% | *Driller:* TZ | *Logger:* AM

WATER OBSERVATIONS:
Water seepage at: None Observed
Water level at completion: None Observed

DRILLING METHODS - 3 1/4" HS Augers
ABANDONMENT - bentonite-cement grout; asphalt patch at surface

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	Natural Moisture Content, % / N_{60} Value
	793.2													PL — LL; Non-Plastic - NP; 10 20 30 40
0.8	792.4						Asphalt - 6" Granular Base - 4"							
		21 30 19	18	S-1			Dense to Very Dense, Brown, Moist, Gravelly SAND with Silt and Cobbles (FILL).							66
		9 12 12	18	S-2										
5														
		10 11 13	18	S-3				44	15	21	12	--8--		
		13 20 24	18	S-4										59
10														
		50/3	1	S-5			@11.0', Large Gravel Piece Stuck in Splitspoon Tip, Low Recovery							50+
		14 19 22	18	S-6										55
15														
16.0	777.2													
		9 17 12	18	S-7			Dense, Reddish Brown, Moist, Silty SAND and Cobbles.	12	3	13	52	9	11	
18.5	774.7						@18.0'-20.0', Auger Chatter							
		13 17 18	18	S-8			Dense, Light Brown, Moist, SAND.							
20														
21.0	772.2													
		9 10 17	4	S-9			Dense, Brown, Moist, SAND with Gravel and Silt.							
23.5	769.7													
		12 15 21	18	S-10		4.25	Hard, Brownish Gray and Gray, Moist, CLAY with Sand.	0	1	2	17	51	29	
25	768.2													

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Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-08 | *Location:* As per plan | *Date Drilled:* 1/15/2022

Rig (#) / ER CME 750X (289498) / 81.0% | *Driller* TZ | *Logger* AM

WATER OBSERVATIONS:
Water seepage at: None Observed
Water level at completion: None Observed

DRILLING METHODS - 3 1/4" HS Augers
ABANDONMENT - bentonite-cement grout; asphalt patch at surface

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	Natural Moisture Content, % - ● PL N_{60} Value ○ LL / Non-Plastic - NP (10 20 30 40)
	768.2						Hard, Brownish Gray and Gray, Moist, CLAY with Sand. (continued)								
		6 11 15	18	S-11		4.5+									
		6 10 11	18	S-12		4.5+									
30.0 30	763.2						Bottom of Boring - 30.0'								
35															
40															
45															
50															

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Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-09 | *Location:* As per plan | *Date Drilled:* 1/7/2022

Rig (#) / ER: CME 750X (289498) / 81.0% | *Driller:* TZ | *Logger:* TZ

WATER OBSERVATIONS:
Water seepage at: 38.5
Water level at completion: Not Recorded

DRILLING METHODS - 3 1/4" HS Augers
ABANDONMENT - bentonite-cement grout

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	Natural Moisture Content, % / N_{60} Value
	792.1														PL ○ LL; Non-Plastic - NP; 10 20 30 40
		2 3 3	14	S-1			Loose, Dark Brown, Moist, Silty SAND with Gravel; Contains Trace Coal Fragments (FILL).		24	10	18	21	--27--		
3.5	788.6														
5		5 5 4	13	S-2			Medium Dense, Brown and Dark Brown, Moist, SAND with Gravel and Silt; Contains Trace Coal Fragments and Stone Fragments (FILL).								
6.0	786.1														
		12 31 17	9	S-3			Very Dense, Dark Brown, Moist, Silty SAND with Gravel and Cobbles, Contains Wood Fragments and Gasoline Odor (FILL).								65
8.5	783.6														
10		10 10 12	17	S-4			Medium Dense to Dense, Dark Brown, Moist, Silty SAND (FILL).								
11.0	781.1														
		46 44 40	13	S-5			Very Dense, Gray and Light Brown, Moist, GRAVEL with Sand and Silt; and Cobbles/Boulders (FILL).								113
13.5	778.6														
15		30 30 29	15	S-6			Very Dense, Light Brown, Moist, SAND with Gravel and Silt (POSSIBLE FILL).								80
16.0	776.1														
		12 17 44	13	S-7			Very Dense, Brown, Moist, Silty SAND with Gravel.		27	9	27	21	8	8	82
18.5	773.6														
20		10 18 50/3	13	S-8			Very Dense, Light Brown, Moist, SAND with Gravel and Silt.								50+
21.0	771.1														
		18 10 16	18	S-9		4.5+	Hard, Brown, Moist, SILTY CLAY with Sand.		3	1	2	17	48	29	
		8 14 18	18	S-10		4.5+	@23.5'-27.5', Contains Trace Iron Oxide Staining								
25	767.1														

Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-09 | *Location:* As per plan | *Date Drilled:* 1/7/2022

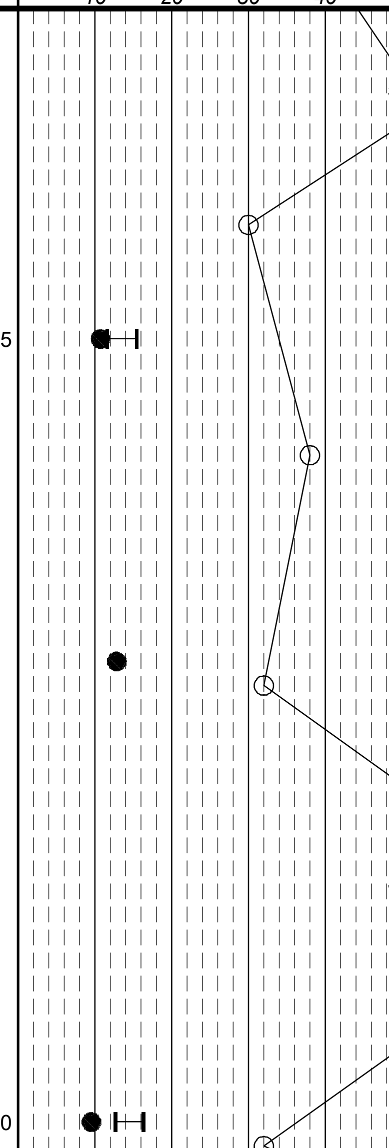
WATER OBSERVATIONS:
Water seepage at: 38.5
Water level at completion: Not Recorded

DRILLING METHODS - 3 1/4" HS Augers
ABANDONMENT - bentonite-cement grout

Rig (#) / ER: CME 750X (289498) / 81.0% | *Driller:* TZ | *Logger:* TZ

Depth (ft)	Elev. (ft) 767.1	Blows per 6"	Recovery (in)	Sample No. (Drive)	Sample No. (Press / Core)	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
							Hard, Brown, Moist, SILTY CLAY with Sand. (continued)						
		9 19 20	18	S-11		4.5+							
		7 9 13	18	S-12		4.5+	@28.5'-38.5', Gray						
30													
31.0	761.1						Hard, Brown, Moist, SILT with SAND.						
					ST-1		@31'-33', UCT = 3.194 TSF	1	1	2	19	52	25
35		8 11 17	18	S-13		4.5+							
38.5	753.6												
		8 11 13	18	S-14			Dense to Very Dense, Dark Gray, Saturated, Silty SAND.	12	8	32	30	11	7
40													
45		11 26 29	18	S-15			@43.5'-48.5', Brown						
48.5	743.6												
50	742.1	14 11 13	13	S-16		3.25	Dense to Very Dense, Brown, Moist, Silty, Clayey SAND.	7	2	12	33	26	20

Natural Moisture Content, % - ●
PL ⊢—⊣ LL
N_{60} Value ○ / Non-Plastic - NP



Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-09 | *Location:* As per plan | *Date Drilled:* 1/7/2022

Rig (#) / ER: CME 750X (289498) / 81.0% | *Driller:* TZ | *Logger:* TZ

WATER OBSERVATIONS:
Water seepage at: 38.5
Water level at completion: Not Recorded

DRILLING METHODS - 3 1/4" HS Augers
ABANDONMENT - bentonite-cement grout

Natural Moisture Content, % - ●
PL ○ *LL*
N_{60} Value / *Non-Plastic -* NP

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	N_{60} Value
	742.1						Dense to Very Dense, Brown, Moist, Silty, Clayey SAND. (continued)								
55		16 30 44	18	S-17		4.5+	@53.5'-60', Gray								100
60.0 60	732.1	13 22 45	18	S-18		3.5									90
							Bottom of Boring - 60.0'								
65															
70															
75															

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Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-2A (HISTORIC) | *Location:* Historical Abutment "B" | *Date Drilled:*

WATER OBSERVATIONS:
Water seepage at:
Water level at completion:
DRILLING METHODS -
ABANDONMENT -

Rig (#) / ER / % *Driller* *Logger*

Natural Moisture Content, % - ●

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	PL N_{60} Value ○ / Non-Plastic - NP (10 20 30 40)
	776.5														
1.0	775.5						Topsoil, Black								
							Sand, Fine to Coarse, Brown, Slightly Moist, Very Dense								
5		7 18 17													
6.5	770.0														
7.5	769.0						Gravel, Fine to Coarse, Brown, Sand, Fine to Coarse, Brown Slightly Moist								
							Sand, Fine to Coarse, Brown, Slightly Moist, Very Dense								
10.0 10	766.5	13 19 33													52
							Clay, Mottled, Slightly Moist								
13.0	763.5														
							Clay, Gray, Moist, Very Stiff								
15		4 8 12													
20		5 11 21													
23.5	753.0														
							Sand, Coarse, Brown, Wet, Dense								
25	751.5	11													

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Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

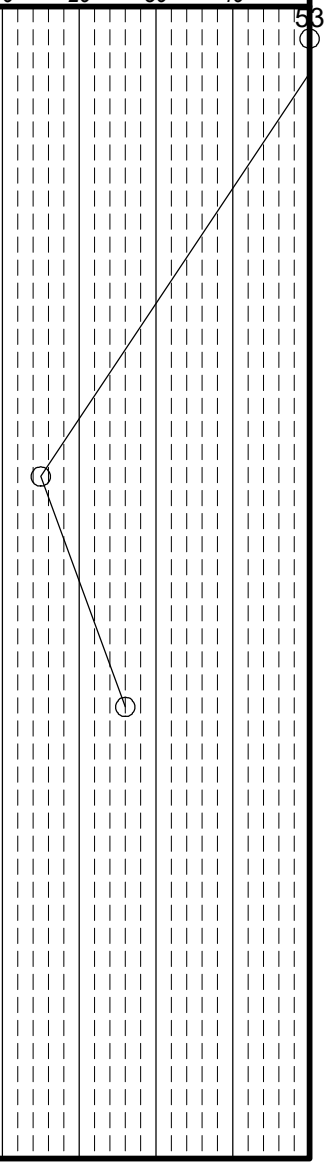
LOG OF: Boring B-2A (HISTORIC) | *Location:* Historical Abutment "B" | *Date Drilled:*

WATER OBSERVATIONS:
Water seepage at:
Water level at completion:
DRILLING METHODS -
ABANDONMENT -

Rig (#) / ER / % | *Driller* | *Logger*

Natural Moisture Content, % - ●
PL N_{60} Value ○ LL / Non-Plastic - NP
10 20 30 40

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
	751.5													
		21 32					Sand, Coarse, Brown, Wet, Dense (continued)							
27.5	749.0													
30							Sand, Fine, Gray, Wet, Trace Gravel, Dense							
34.0	742.5						@32.5', Encountered Boulder, Boring Offset 10' West							
35		5 5 10					Silty Clay, Some Sand and Gravel, Brown, Slightly Moist, Stiff							
37.4	739.1						Silty Clay, Some Sand and Gravel, Gray, Slightly Moist, Hard							
40		32 12 14												
40.5	736.0						Bottom of Boring - 40.5'							
45														
50														



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Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-2B (HISTORIC) | *Location:* Historical Pier 2 | *Date Drilled:*

WATER OBSERVATIONS:
Water seepage at:
Water level at completion:
DRILLING METHODS -
ABANDONMENT -

Rig (#) / ER / % | *Driller* | *Logger*

Natural Moisture Content, % - ●

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
	771.5													
2.8	768.8						Railroad Ballast, Sand and Gravel, Wet							
5		17 11 19					Clayey Silt, Some Gravel, Brown, Moist, Very Stiff							
7.5	764.0													
10		5 7 10					Clayey Silt, Some Gravel, Gray, Moist, Very Stiff							
12.8	758.8													
15		6 9 15					Sand, Fine, Gray, Wet, Medium Dense With Layers of Sandy Gray Clay							
20		6 8 14												
22.0	749.5						Sand, Fine to Coarse, Gray, Wet, Dense							
25	746.5	15 23												

PL N_{60} Value ○ 10 20 30 40 / Non-Plastic - NP — LL

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Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-2B (HISTORIC) | *Location:* Historical Pier 2 | *Date Drilled:*

Rig (#) / ER / % | *Driller* | *Logger*

WATER OBSERVATIONS:
Water seepage at:
Water level at completion:
DRILLING METHODS -
ABANDONMENT -

Natural Moisture Content, % - ●
PL ○ LL
N_{60} Value / Non-Plastic - NP
10 20 30 40 50+

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
746.5									GRADATION					
25.5	746.0	27		■			Bottom of Boring - 25.5'							

30
35
40
45
50

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Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

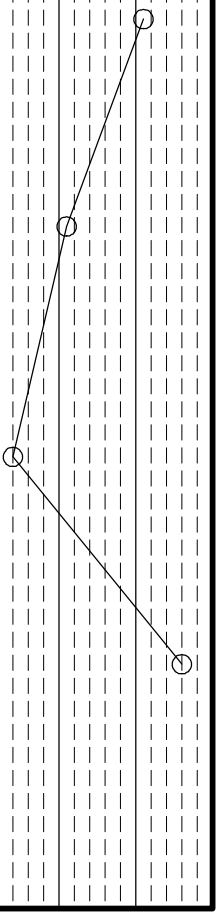
LOG OF: Boring B-2C (HISTORIC) | *Location:* Historical Pier 1 | *Date Drilled:*

WATER OBSERVATIONS:
Water seepage at:
Water level at completion:
DRILLING METHODS -
ABANDONMENT -

Rig (#) / ER / % | *Driller* | *Logger*

Natural Moisture Content, % - ●
PL N_{60} Value ○ LL / Non-Plastic - NP
10 20 30 40

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
	776.5													
							Railroad Ballast, Sand and Gravel, Wet							
3.5	773.0													
							Sandy Silt, Some Clay and Gravel, Brown, Moist, Very Stiff (Stone in Tip)							
5		10 17 24												
7.0	769.5													
8.0	768.5						Sand, Wet							
							Silty Clay, Gray, Moist, Very Stiff							
10		8 13 18												
15		4 10 14												
17.5	759.0													
							Sand, Fine to Medium, Trace Gravel, Gray, Moist, Dense with Layers of Sandy Clay							
20		7 20 26												
25	751.5													



DLZ Ohio, Inc. * 6121 Huntley Road, Columbus, Ohio 43229 * (614) 888-0040

Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-2C (HISTORIC) | *Location:* Historical Pier 1 | *Date Drilled:*

Rig (#) / ER / % | *Driller* | *Logger*

WATER OBSERVATIONS:
Water seepage at:
Water level at completion:
DRILLING METHODS -
ABANDONMENT -

Natural Moisture Content, % - ●
PL N_{60} Value ○ LL / Non-Plastic - NP
10 20 30 40

Depth (ft)	Elev. (ft) 751.5	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
~~25.5~~	751.0						Bottom of Boring - 25.5'							
30														
35														
40														
45														
50														

DLZ Ohio, Inc. * 6121 Huntley Road, Columbus, Ohio 43229 * (614) 888-0040

Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-2D (HISTORIC) | *Location:* Historical Abutment "A" | *Date Drilled:*

WATER OBSERVATIONS:
Water seepage at:
Water level at completion:
DRILLING METHODS -
ABANDONMENT -

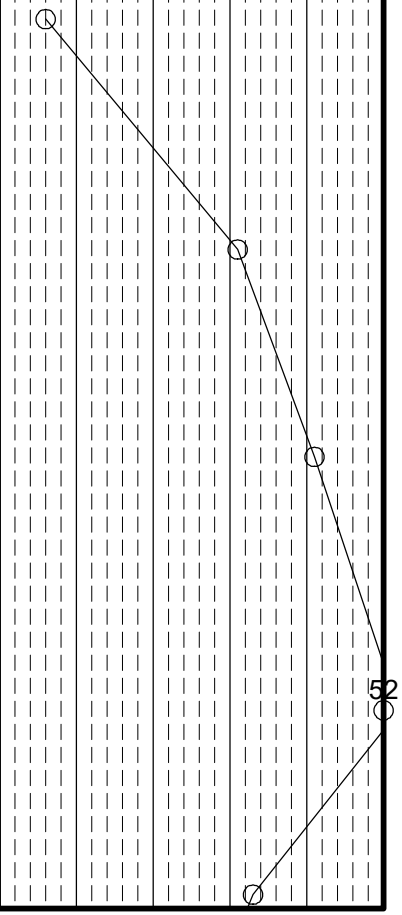
Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
	784.5													
1.0	783.5						Gravel, Moist							
4.0	780.5						Sand, Fine, Dark Brown, Some Organics, Trace Silt and Gravel, Moist							
4.5	780.0						Asphalt							
5		9 3 3					Organic Silt, Trace Sand, Dark Brown, Moist							
7.0	777.5													
							Sandy Gravel, Brown, Slightly Moist, Dense							
10		5 12 19												
11.5	773.0													
							Sand, Medium to Coarse, Brown, Wet, Dense							
15		15 19 22												
18.5	766.0													
							Clayey Silt, Brown, Slightly Moist, Hard							
20		17 19 33												
24.0	760.5	8 12 21					Silty Clay, Gray, Some Gravel, Slightly Moist, Hard							
25	759.5													

GRADATION

Rig (#) / ER / % | *Driller* | *Logger*

Natural Moisture Content, % - ●

PL N_{60} Value ○ 10 20 / Non-Plastic - NP 30 40 LL



DLZ Ohio, Inc. * 6121 Huntley Road, Columbus, Ohio 43229 * (614) 888-0040

Client: City of Ann Arbor | *Project:* EMCD Bridge Rehabilitation | *Job No.* 2141-7363.00

LOG OF: Boring B-2D (HISTORIC) | *Location:* Historical Abutment "A" | *Date Drilled:*

WATER OBSERVATIONS:
Water seepage at:
Water level at completion:
DRILLING METHODS -
ABANDONMENT -

Rig (#) / ER / % | *Driller* | *Logger*

Natural Moisture Content, % - ●

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	Graphic Log	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
	759.5													
							Silty Clay, Gray, Some Gravel, Slightly Moist, Hard (continued)							
28.0	756.5													
		7 7 12					Sand, Fine, Gray, Saturated, Medium Dense							
30														
34.0	750.5													
		15 12 21					Sand, Fine to Coarse, Trace Silt, Gray, Saturated, Dense							
35														
38.0	746.5													
							Sandy Clay, Gray, Moist, Hard							
40		16 16 32												
40.5	744.0													
							Bottom of Boring - 40.5'							
45														
50														

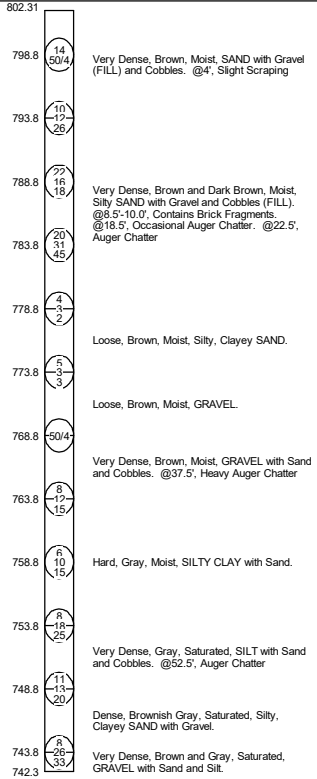
GRADATION

N_{60} Value: PL ○ / Non-Plastic - NP ; LL

10 20 30 40

TEST HOLE NO. B-01

LOCATION STATION:
OF CL
As per plan
GROUND SURFACE ELEVATION: 802.31 ft

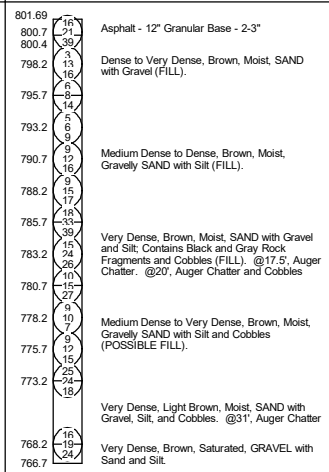


BORING DATE 1/16/22

Water Seepage : 43.5'
Water at Completion : 46.1'

TEST HOLE NO. B-02

LOCATION STATION:
OF CL
As per plan
GROUND SURFACE ELEVATION: 801.69 ft

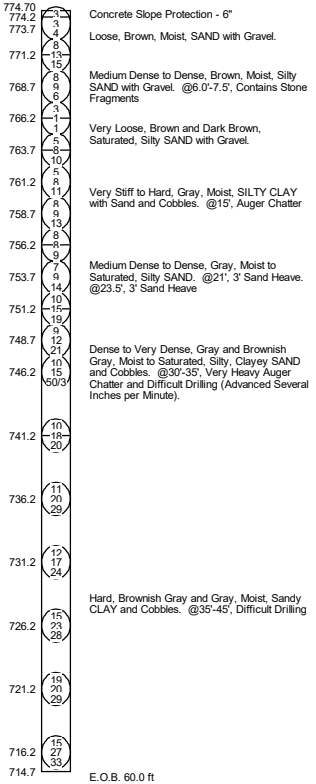


BORING DATE 1/15/22

Water Seepage : 33.5'
Water at Completion : 33.2'

TEST HOLE NO. B-03

LOCATION STATION:
OF CL
As per plan
GROUND SURFACE ELEVATION: 774.70 ft

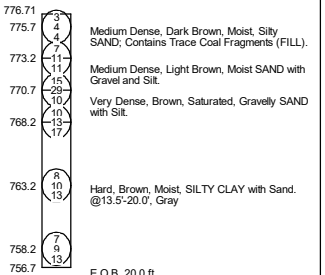


BORING DATE 1/29/22

Water Seepage : 8.5'
Water at Completion : 13.9' (11.0' Prior to Adding Water)
Notes: Concrete Deck = 9", Top of Ground at Boring = 25.0' Below Top of Deck

TEST HOLE NO. B-04

LOCATION STATION:
OF CL
As per plan
GROUND SURFACE ELEVATION: 776.71 ft

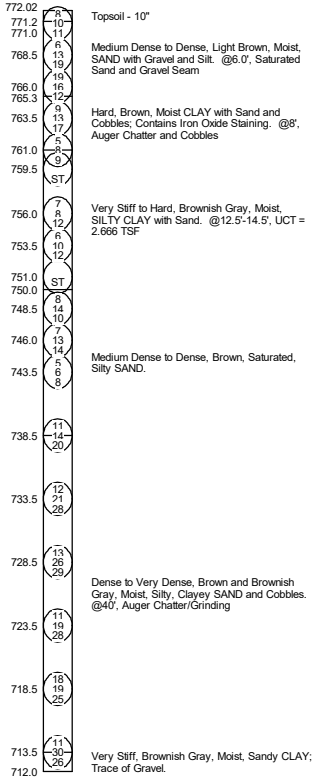


BORING DATE 1/6/22

Water Seepage : 6'
Water at Completion : None Observed

TEST HOLE NO. B-05

LOCATION STATION:
OF CL
As per plan
GROUND SURFACE ELEVATION: 772.02 ft

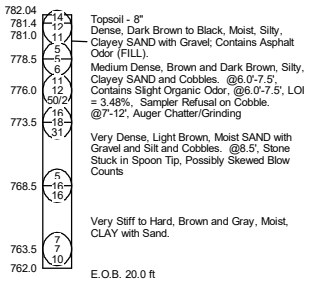


BORING DATE 1/4/22

Water Seepage : 6'
Water at Completion : 30'

TEST HOLE NO. B-06

LOCATION STATION:
OF CL
As per plan
GROUND SURFACE ELEVATION: 782.04 ft



BORING DATE 1/3/22

Water Seepage : None Observed
Water at Completion : None Observed

(0 / 0 / 0) 1st 6 in, 2nd 6 in, 3rd 6 in

NUMBERS IN CIRCLES DENOTE NUMBER OF BLOWS REQUIRED TO DRIVE A 2" O.D. X 1.5" I.D. SPLIT SPOON SAMPLER 3 SUCCESSIVE 6" INCREMENTS USING A 140 lb HAMMER FALLING 30".

WATER LEVELS MAY BE INFLUENCED BY RESIDUAL BORING WATER

THE SOIL BORING LOGS REPRESENT POINT INFORMATION. PRESENTATION OF THIS INFORMATION IN NO WAY IMPLIES THAT THE SUBSURFACE CONDITIONS ARE THE SAME AT LOCATIONS OTHER THAN THE EXACT LOCATION OF THE BORING.

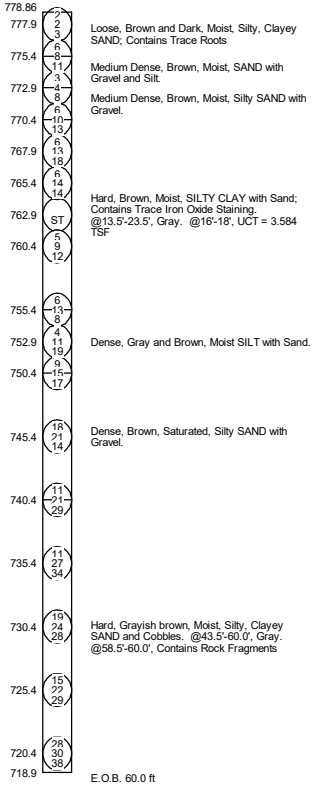
MDOT Michigan Department of Transportation

SOIL BORING DATA

DATE	SCALE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET NO.
7/21/22	1in to 15.4ft		2141-7363.00	Feet	1 of 3

TEST HOLE NO. B-07

LOCATION STATION:
OF CL
As per plan
GROUND SURFACE ELEVATION: 778.86 ft



Loose, Brown and Dark, Moist, Silty, Clayey SAND; Contains Trace Roots

Medium Dense, Brown, Moist, SAND with Gravel and Silt.

Medium Dense, Brown, Moist, Silty SAND with Gravel.

Hard, Brown, Moist, SILTY CLAY with Sand; Contains Trace Iron Oxide Staining. @13.5'-23.5', Gray. @16'-18', UCT = 3.584 TSF

Dense, Gray and Brown, Moist SILT with Sand.

Dense, Brown, Saturated, Silty SAND with Gravel.

Hard, Grayish brown, Moist, Silty, Clayey SAND and Cobbles. @43.5'-60.0', Gray. @58.5'-60.0', Contains Rock Fragments

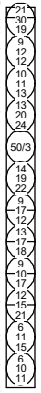
E.O.B. 60.0 ft

BORING DATE 1/5/22

Water Seepage : 28.5'
Water at Completion : Not Recorded

TEST HOLE NO. B-08

LOCATION STATION:
OF CL
As per plan
GROUND SURFACE ELEVATION: 793.19 ft



Asphalt - 6", Granular Base - 4"

Dense to Very Dense, Brown, Moist, Gravelly SAND with Silt and Cobbles (FILL). @11.0', Large Gravel Stuck in Splitspoon Tip, Low Recovery

Dense, Reddish Brown, Moist, Silty SAND and Cobbles. @18.0'-20.0', Auger Chatter

Dense, Light Brown, Moist, SAND.

Dense, Brown, Moist, SAND with Gravel and Silt.

Hard, Brownish Gray and Gray, Moist, CLAY with Sand.

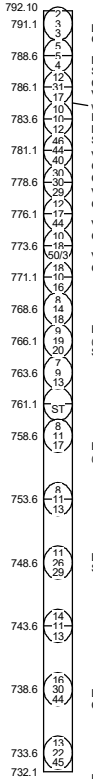
E.O.B. 30.0 ft

BORING DATE 1/15/22

Water Seepage : None Observed
Water at Completion : None Observed

TEST HOLE NO. B-09

LOCATION STATION:
OF CL
As per plan
GROUND SURFACE ELEVATION: 792.10 ft



Loose, Dark Brown, Moist, Silty SAND with Gravel; Contains Trace Coal Fragments (FILL).

Medium Dense, Brown and Dark Brown, Moist, SAND with Gravel and Silt; Contains Trace Coal Fragments and Stone Fragments (FILL).

Very Dense, Dark Brown, Moist, Silty SAND with Gravel and Cobbles, Contains Wood Fragments and Gasoline Odor (FILL).

Medium Dense to Dense, Dark Brown, Moist, Silty SAND (FILL).

Very Dense, Gray and Light Brown, Moist, GRAVEL with Sand and Silt; and Cobbles/Boulders (FILL).

Very Dense, Light Brown, Moist, SAND with Gravel and Silt (POSSIBLE FILL).

Very Dense, Brown, Moist, Silty SAND with Gravel.

Very Dense, Light Brown, Moist, SAND with Gravel and Silt.

Hard, Brown, Moist, SILTY CLAY with Sand. @23.5'-27.5', Contains Trace Iron Oxide Staining. @28.5'-38.5', Gray

Hard, Brown, Moist, SILT with SAND. @31'-33', UCT = 3.194 TSF

Dense to Very Dense, Dark Gray, Saturated, Silty SAND. @43.5'-48.5', Brown

Dense to Very Dense, Brown, Moist, Silty, Clayey SAND. @53.5'-60', Gray

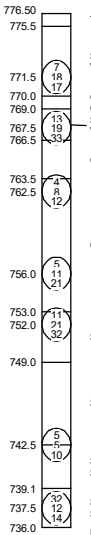
E.O.B. 60.0 ft

BORING DATE 1/7/22

Water Seepage : 38.5'
Water at Completion : Not Recorded

TEST HOLE NO. B-2A (HISTORIC)

LOCATION STATION:
OF CL
Historical Abutment "B"
GROUND SURFACE ELEVATION: 776.50 ft



Topsoil, Black

Sand, Fine to Coarse, Brown, Slightly Moist, Very Dense

Gravel, Fine to Coarse, Brown, Sand, Fine to Coarse, Brown Slightly Moist

Sand, Fine to Coarse, Brown, Slightly Moist, Very Dense

Clay, Mottled, Slightly Moist

Clay, Gray, Moist, Very Stiff

Sand, Coarse, Brown, Wet, Dense

Sand, Fine, Gray, Wet, Trace Gravel, Dense

Silty Clay, Some Sand and Gravel, Brown, Slightly Moist, Stiff

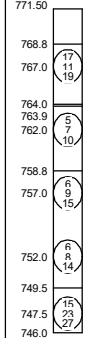
Silty Clay, Some Sand and Gravel, Gray, Slightly Moist, Hard

E.O.B. 40.5 ft

BORING DATE

TEST HOLE NO. B-2B (HISTORIC)

LOCATION STATION:
OF CL
Historical Pier 2
GROUND SURFACE ELEVATION: 771.50 ft



Railroad Ballast, Sand and Gravel, Wet

Clayey Silt, Some Gravel, Brown, Moist, Very Stiff

@7.65', Bottom of Pier "2", Footing Elev. 764.35

Clayey Silt, Some Gravel, Gray, Moist, Very Stiff

Sand, Fine, Gray, Wet, Medium Dense With Layers of Sandy Gray Clay

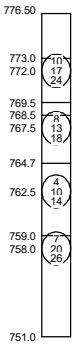
Sand, Fine to Coarse, Gray, Wet, Dense

E.O.B. 25.5 ft

BORING DATE

TEST HOLE NO. B-2C (HISTORIC)

LOCATION STATION:
OF CL
Historical Pier 1
GROUND SURFACE ELEVATION: 776.50 ft



Railroad Ballast, Sand and Gravel, Wet

Sandy Silt, Some Clay and Gravel, Brown, Moist, Very Stiff (Stone in Tip)

Sand, Wet

@11.8', Bottom of Pier "1", Footing Elev. 765.20

Silty Clay, Gray, Moist, Very Stiff

Sand, Fine to Medium, Trace Gravel, Gray, Moist, Dense with Layers of Sandy Clay

E.O.B. 25.5 ft

BORING DATE

0 1st 6 in
0 2nd 6 in
0 3rd 6 in

NUMBERS IN CIRCLES DENOTE NUMBER OF BLOWS REQUIRED TO DRIVE A 2" O.D. X 1.5" I.D. SPLIT SPOON SAMPLER 3 SUCCESSIVE 6" INCREMENTS USING A 140 lb HAMMER FALLING 30".

WATER LEVELS MAY BE INFLUENCED BY RESIDUAL BORING WATER

THE SOIL BORING LOGS REPRESENT POINT INFORMATION. PRESENTATION OF THIS INFORMATION IN NO WAY IMPLIES THAT THE SUBSURFACE CONDITIONS ARE THE SAME AT LOCATIONS OTHER THAN THE EXACT LOCATION OF THE BORING.

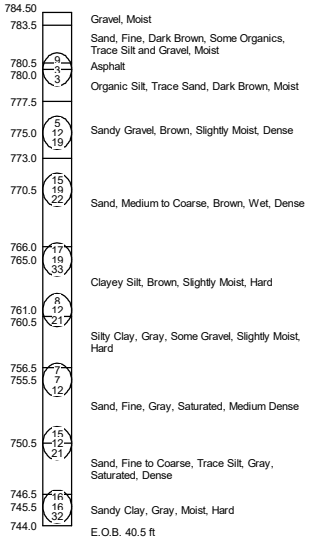
MDOT Michigan Department of Transportation

SOIL BORING DATA

DATE	SCALE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET NO.
7/21/22	1in to 15.4ft		2141-7363.00	Feet	2 of 3

TEST HOLE NO. B-2D (HISTORIC)

LOCATION STATION:
OF CL
Historical Abutment "A"
GROUND SURFACE ELEVATION: 784.50 ft



BORING DATE

0 1st 6 in
0 2nd 6 in
0 3rd 6 in

NUMBERS IN CIRCLES DENOTE NUMBER OF BLOWS REQUIRED TO DRIVE A 2" O.D. X 1.5" I.D. SPLIT SPOON SAMPLER 3 SUCCESSIVE 6" INCREMENTS USING A 140 lb HAMMER FALLING 30".

WATER LEVELS MAY BE INFLUENCED BY RESIDUAL BORING WATER

THE SOIL BORING LOGS REPRESENT POINT INFORMATION. PRESENTATION OF THIS INFORMATION IN NO WAY IMPLIES THAT THE SUBSURFACE CONDITIONS ARE THE SAME AT LOCATIONS OTHER THAN THE EXACT LOCATION OF THE BORING.

MDOT Michigan Department of Transportation

SOIL BORING DATA

DATE	SCALE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET NO.
7/21/22	1in to 15.4ft		2141-7363.00	Feet	3 of 3

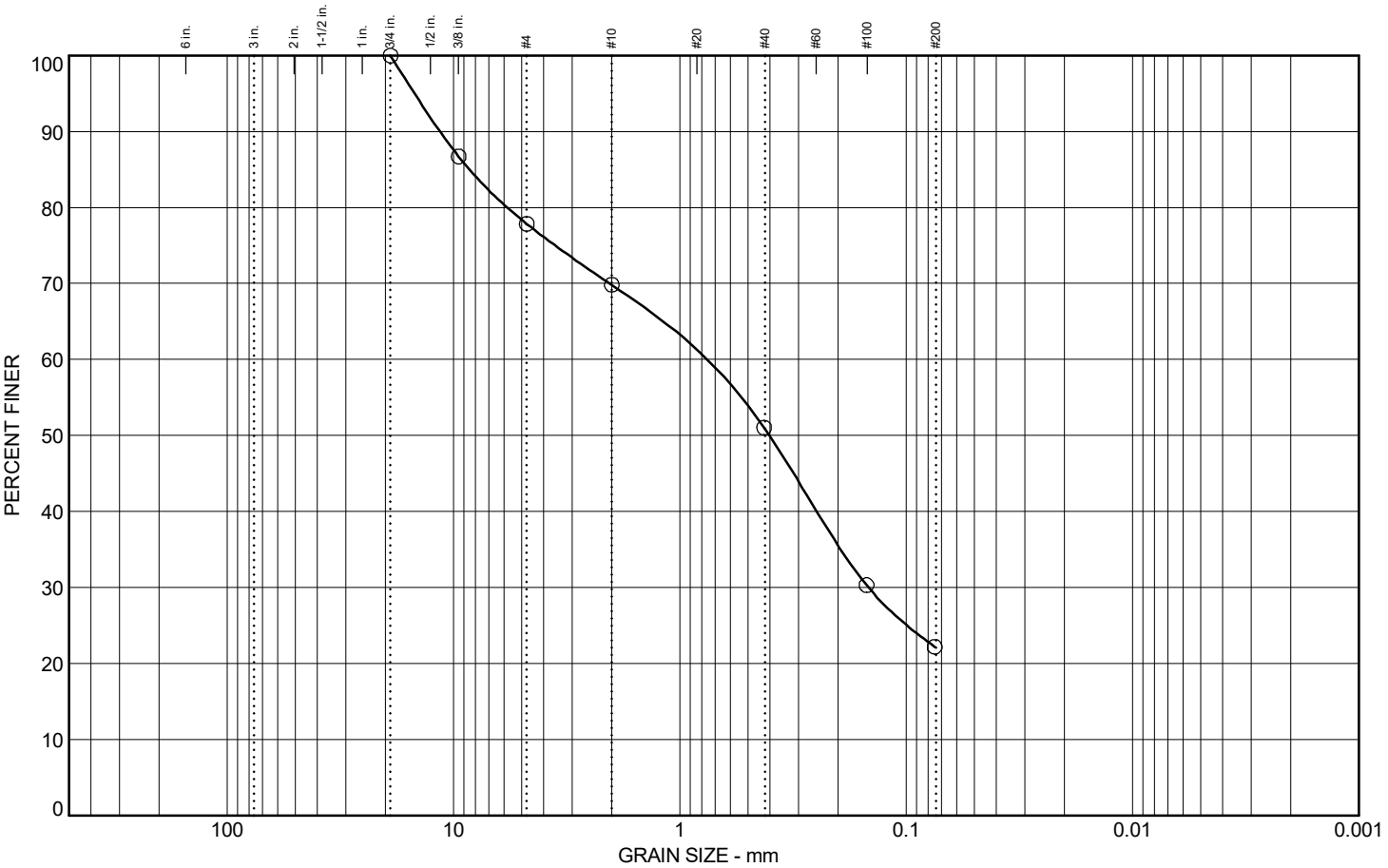
INNOVATIVE IDEAS
EXCEPTIONAL DESIGN
UNMATCHED CLIENT SERVICE

ARCHITECTURE • ENGINEERING • PLANNING
SURVEYING • CONSTRUCTION SERVICES

APPENDIX B

Grain Size Analysis Reports
LOI Test Report
Soil Unconfined Compressive Strength Test Reports
Consolidation Test Report

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	22.2	8.0	18.8	28.9	22.2	

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19	100.0		
9.5	86.7		
4.75	77.8		
2	69.8		
0.425	51.0		
0.15	30.3		
0.075	22.2		

* (no specification provided)

Soil Description

General Characteristics

Moisture Content = 11.8%

Atterberg Limits

LL= PL= PI=

Coefficients

D_{85}= 8.309 D_{60}= 0.89 D_{50}= 0.404
D_{30}= 0.146 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS = AASHTO =

Remarks

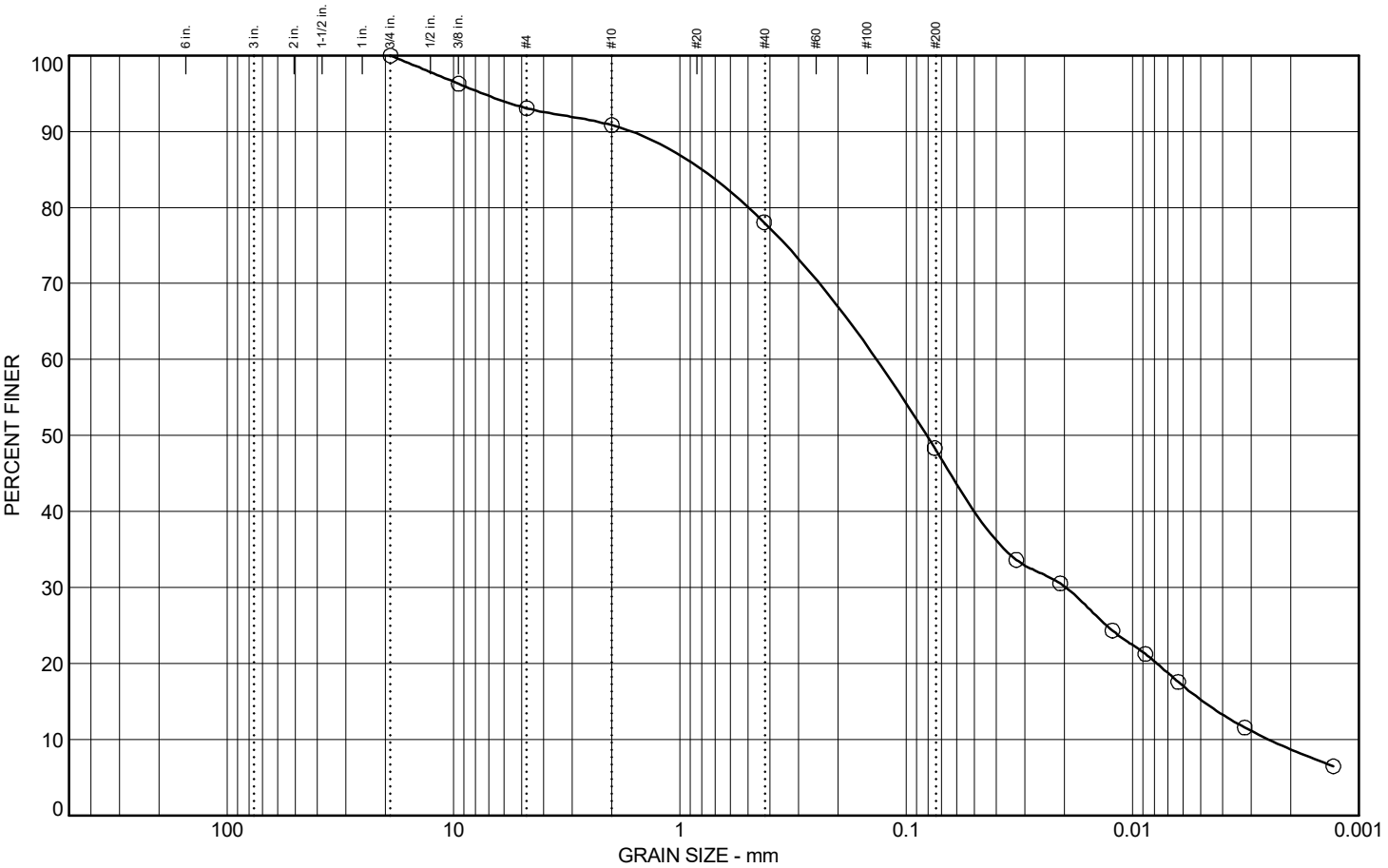
Group Index =

Sample No.: S-3 **Source of Sample:** B-01 **Date:**
Location: - **Depth / Elev:** 13.5' / 788.81'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	6.9	2.2	12.8	29.7	32.8	15.5

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19	100.0		
9.5	96.3		
4.75	93.1		
2	90.8		
0.425	78.1		
0.075	48.3		

* (no specification provided)

Soil Description

fine to medium sand, low plasticity clay

General Characteristics

Moisture Content = 15.3% Specific Gravity = 2.76

Atterberg Limits

LL= 20 PL= 15 PI= 5

Coefficients

D_{85}= 0.986 D_{60}= 0.148 D_{50}= 0.083
D_{30}= 0.02 D_{15}= 0.005 D_{10}= 0.002
C_u= 60.86 C_c= 1.11

Classification

USCS = SC-SM AASHTO = A-4

Remarks

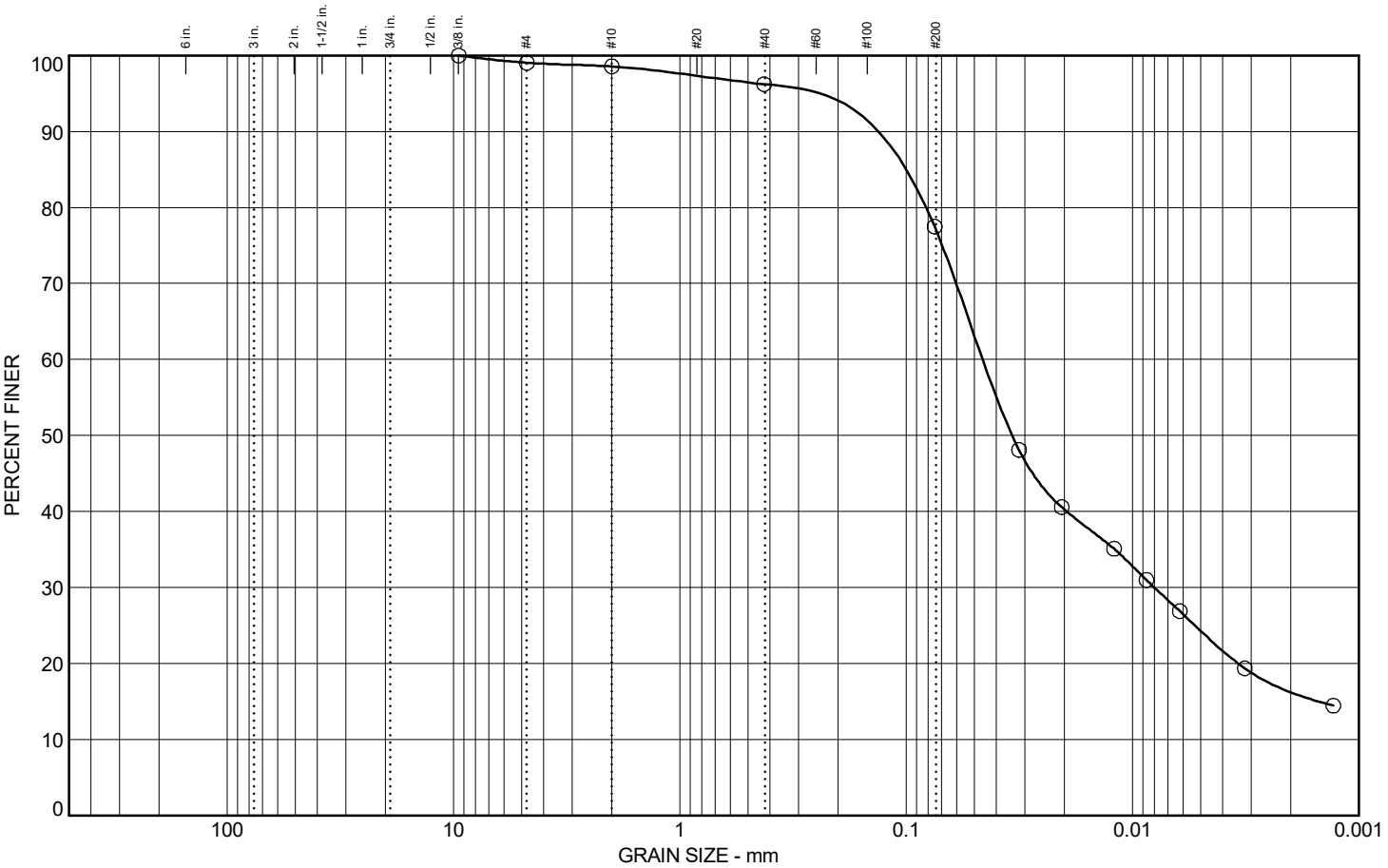
Group Index = 0

Sample No.: S-5 **Source of Sample:** B-01 **Date:**
Location: - **Depth / Elev:** 23.5' / 778.81'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.0	0.5	2.3	18.8	53.1	24.4

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5	100.0		
4.75	99.0		
2	98.6		
0.425	96.2		
0.075	77.5		

* (no specification provided)

Soil Description

low plasticity clay, fine sand

General Characteristics

Moisture Content = 11.0% Specific Gravity = 2.73

Atterberg Limits

LL= 18 PL= 12 PI= 6

Coefficients

D_{85}= 0.15 D_{60}= 0.045 D_{50}= 0.034
D_{30}= 0.008 D_{15}= 0.001 D_{10}=
C_u= C_c=

Classification

USCS = CL-ML AASHTO = A-4

Remarks

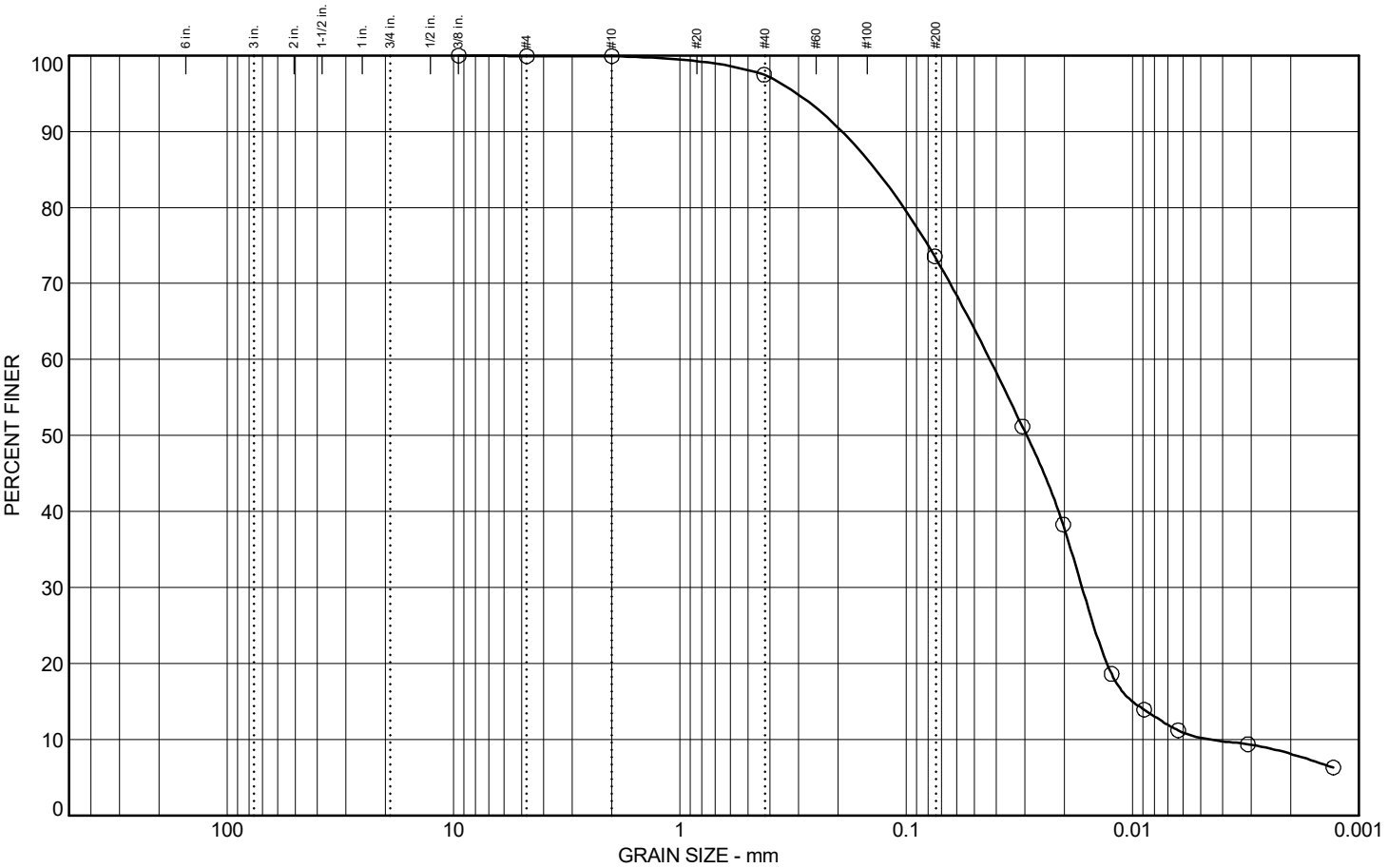
Group Index = 1

Sample No.: S-8 **Source of Sample:** B-01 **Date:**
Location: - **Depth / Elev:** 38.5' / 763.81'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.1	0.0	2.4	23.9	63.0	10.6

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5	100.0		
4.75	99.9		
2	99.9		
0.425	97.5		
0.075	73.6		

* (no specification provided)

Soil Description

low plasticity silt, fine sand

General Characteristics

Moisture Content = 17.4% Specific Gravity = 2.76

Atterberg Limits

LL= 17 PL= 16 PI= 1

Coefficients

D_{85}= 0.172 D_{60}= 0.044 D_{50}= 0.03
D_{30}= 0.016 D_{15}= 0.01 D_{10}= 0.004
C_u= 10.96 C_c= 1.57

Classification

USCS = ML AASHTO = A-4

Remarks

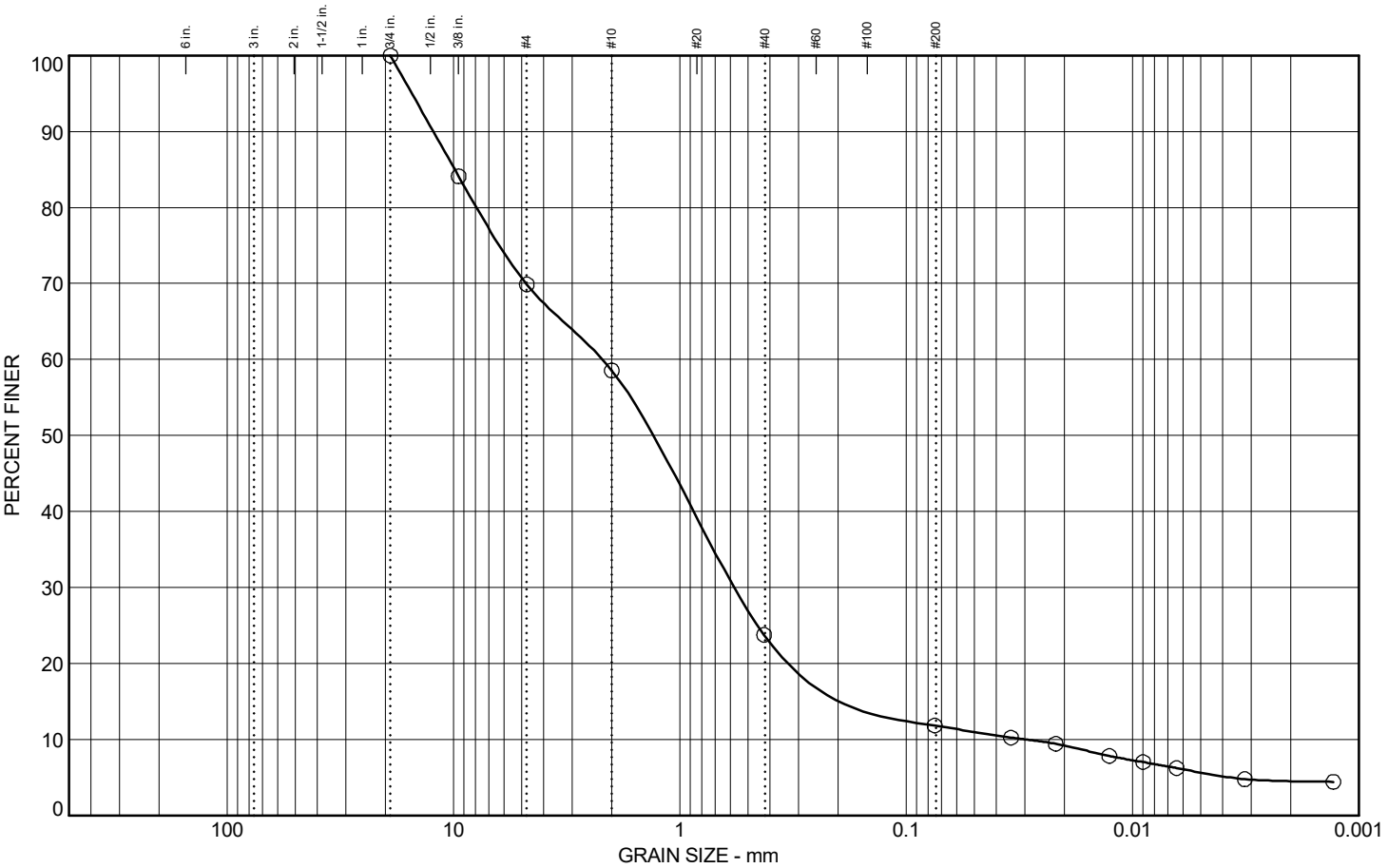
Group Index = 0

Sample No.: S-10 **Source of Sample:** B-01 **Date:**
Location: - **Depth / Elev:** 48.5' / 753.81'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	30.1	11.3	34.8	11.9	6.1	5.7

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19	100.0		
9.5	84.1		
4.75	69.9		
2	58.5		
0.425	23.7		
0.075	11.8		

* (no specification provided)

Soil Description

General Characteristics

Moisture Content = 5.3% Specific Gravity = 2.76

Atterberg Limits

LL= PL= PI=

Coefficients

D_{85}= 9.881 D_{60}= 2.236 D_{50}= 1.368
D_{30}= 0.561 D_{15}= 0.119 D_{10}= 0.031
C_u= 73.21 C_c= 4.62

Classification

USCS = AASHTO =

Remarks

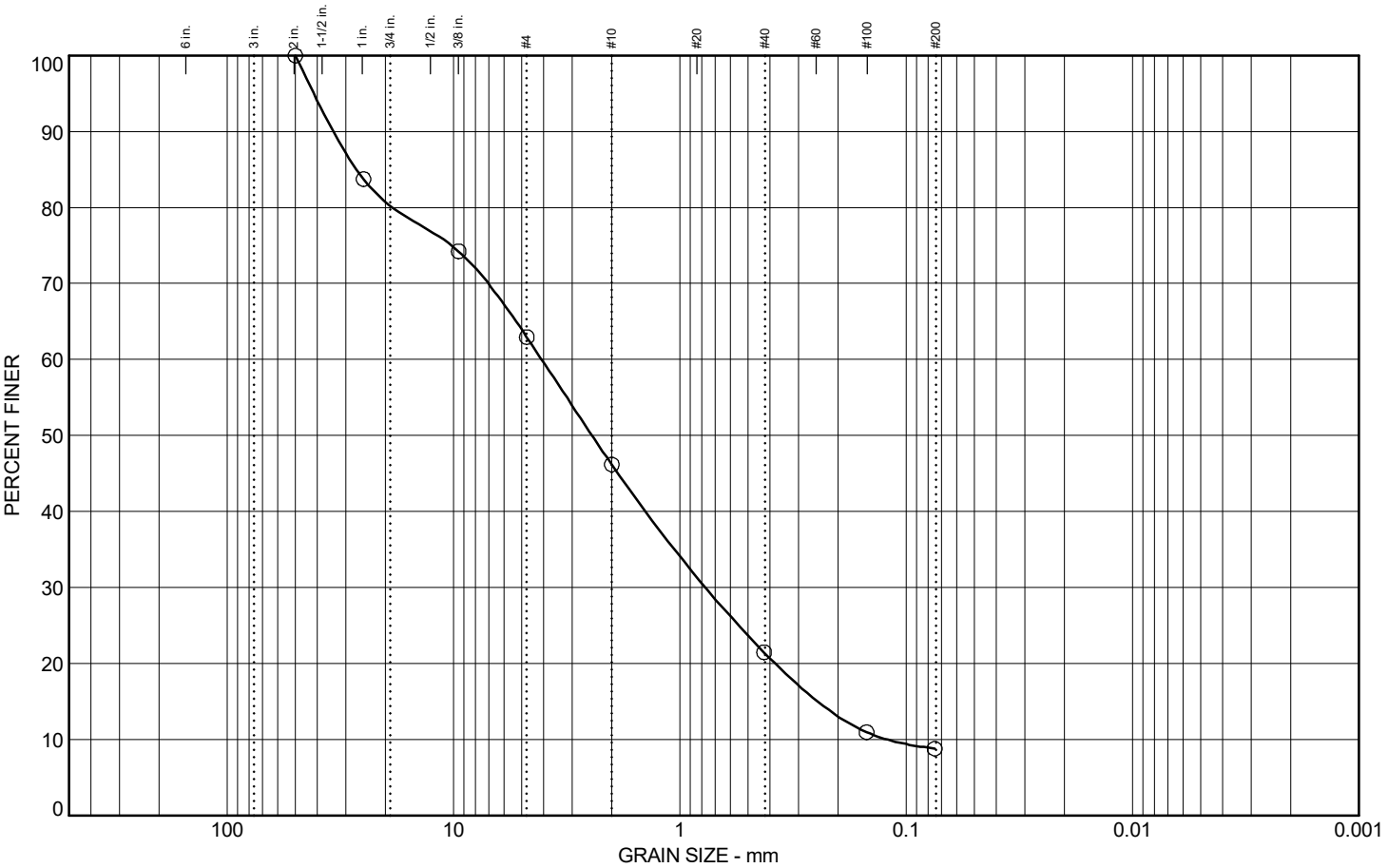
Group Index =

Sample No.: Bulk-1 **Source of Sample:** B-02 **Date:**
Location: - **Depth / Elev:** 1.1' / 800.59'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	19.0	18.1	16.8	24.7	12.7	8.8	

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
50	100.0		
25	83.7		
9.5	74.2		
4.75	62.9		
2	46.2		
0.425	21.5		
0.15	10.9		
0.075	8.8		

* (no specification provided)

Soil Description

General Characteristics

Moisture Content = 3.6%

Atterberg Limits

LL= PL= PI=

Coefficients

D_{85}= 26.373 D_{60}= 4.082 D_{50}= 2.437
D_{30}= 0.726 D_{15}= 0.224 D_{10}= 0.111
C_u= 36.73 C_c= 1.16

Classification

USCS = AASHTO =

Remarks

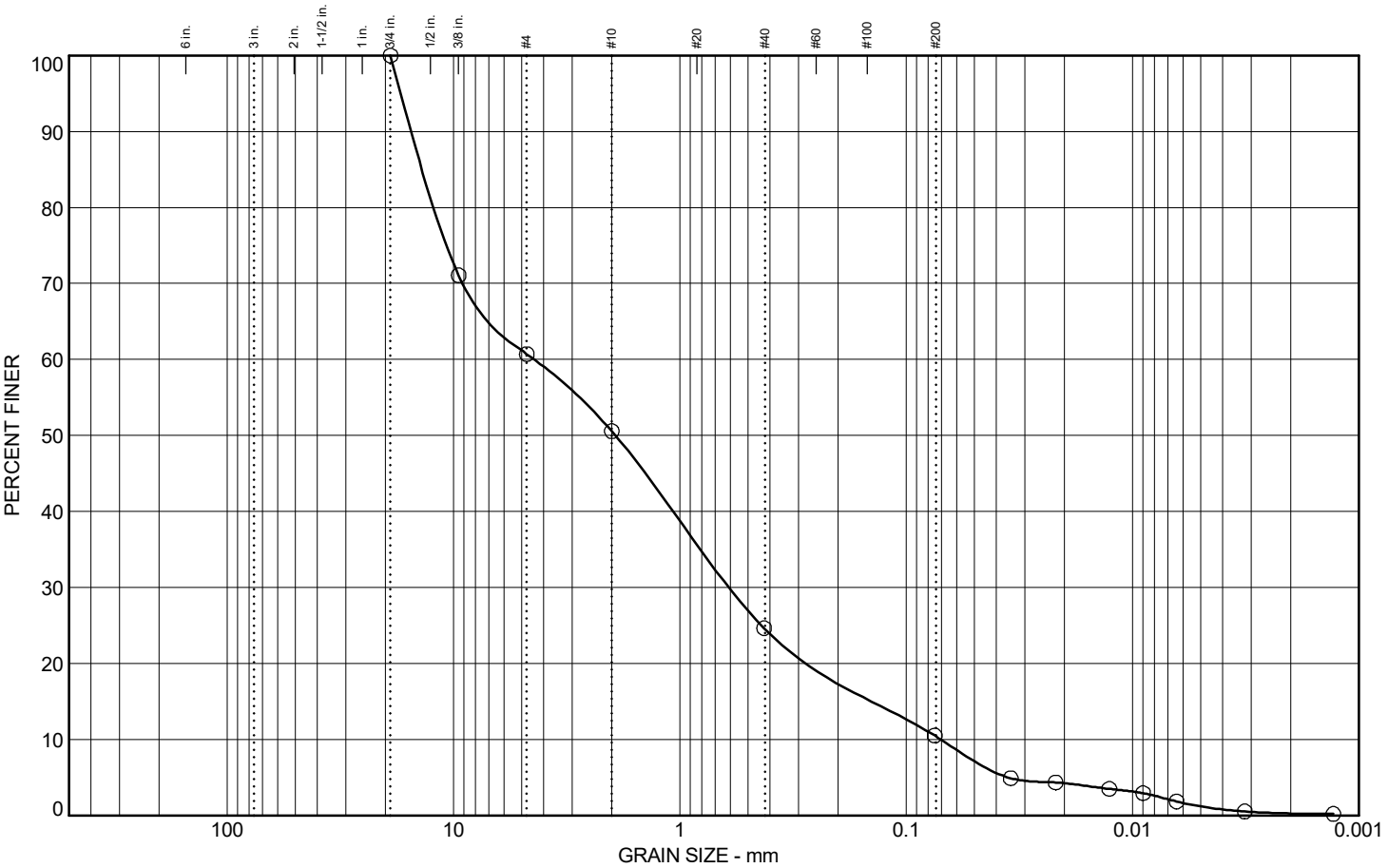
Group Index =

Sample No.: S-4 **Source of Sample:** B-02 **Date:**
Location: - **Depth / Elev:** 8.5' / 793.19'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	39.3	10.1	25.9	14.1	9.1	1.3

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19	100.0		
9.5	71.1		
4.75	60.7		
2	50.6		
0.425	24.6		
0.075	10.5		

* (no specification provided)

Soil Description

General Characteristics

Moisture Content = 5.0% Specific Gravity = 2.76

Atterberg Limits

LL= PL= PI=

Coefficients

D_{85}= 13.265 D_{60}= 4.475 D_{50}= 1.934
D_{30}= 0.586 D_{15}= 0.13 D_{10}= 0.07
C_u= 63.88 C_c= 1.09

Classification

USCS = AASHTO =

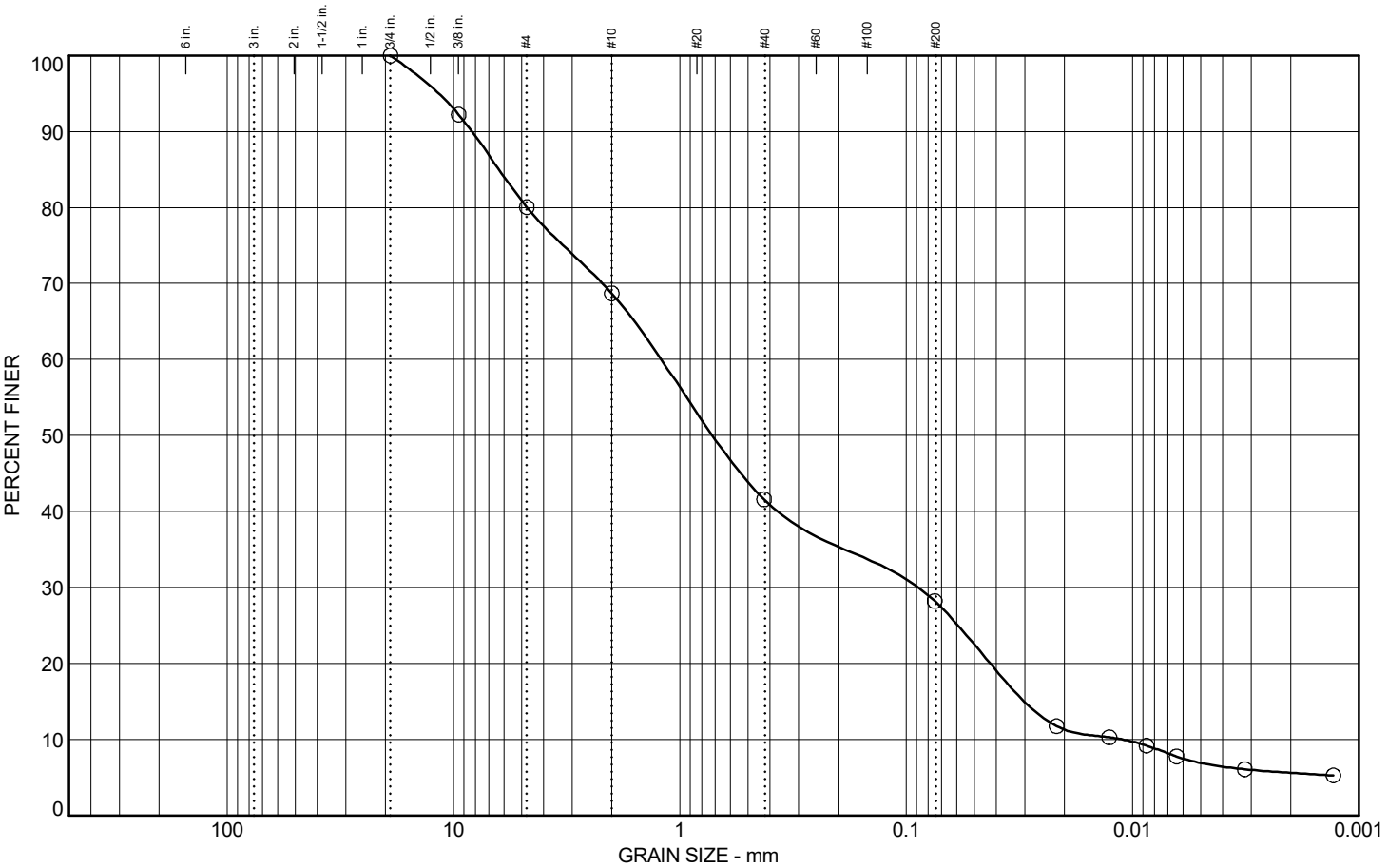
Remarks

Group Index =

Sample No.: S-9 **Source of Sample:** B-02 **Date:**
Location: - **Depth / Elev:** 21' / 780.69'

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	20.0	11.4	27.1	13.4	21.1	7.1

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19	100.0		
9.5	92.2		
4.75	80.0		
2	68.7		
0.425	41.6		
0.075	28.2		

* (no specification provided)

Soil Description

General Characteristics

Moisture Content = 7.8% Specific Gravity = 2.74

Atterberg Limits

LL= PL= PI=

Coefficients

D_{85}= 6.297 D_{60}= 1.217 D_{50}= 0.688
D_{30}= 0.095 D_{15}= 0.028 D_{10}= 0.012
C_u= 104.92 C_c= 0.64

Classification

USCS = AASHTO =

Remarks

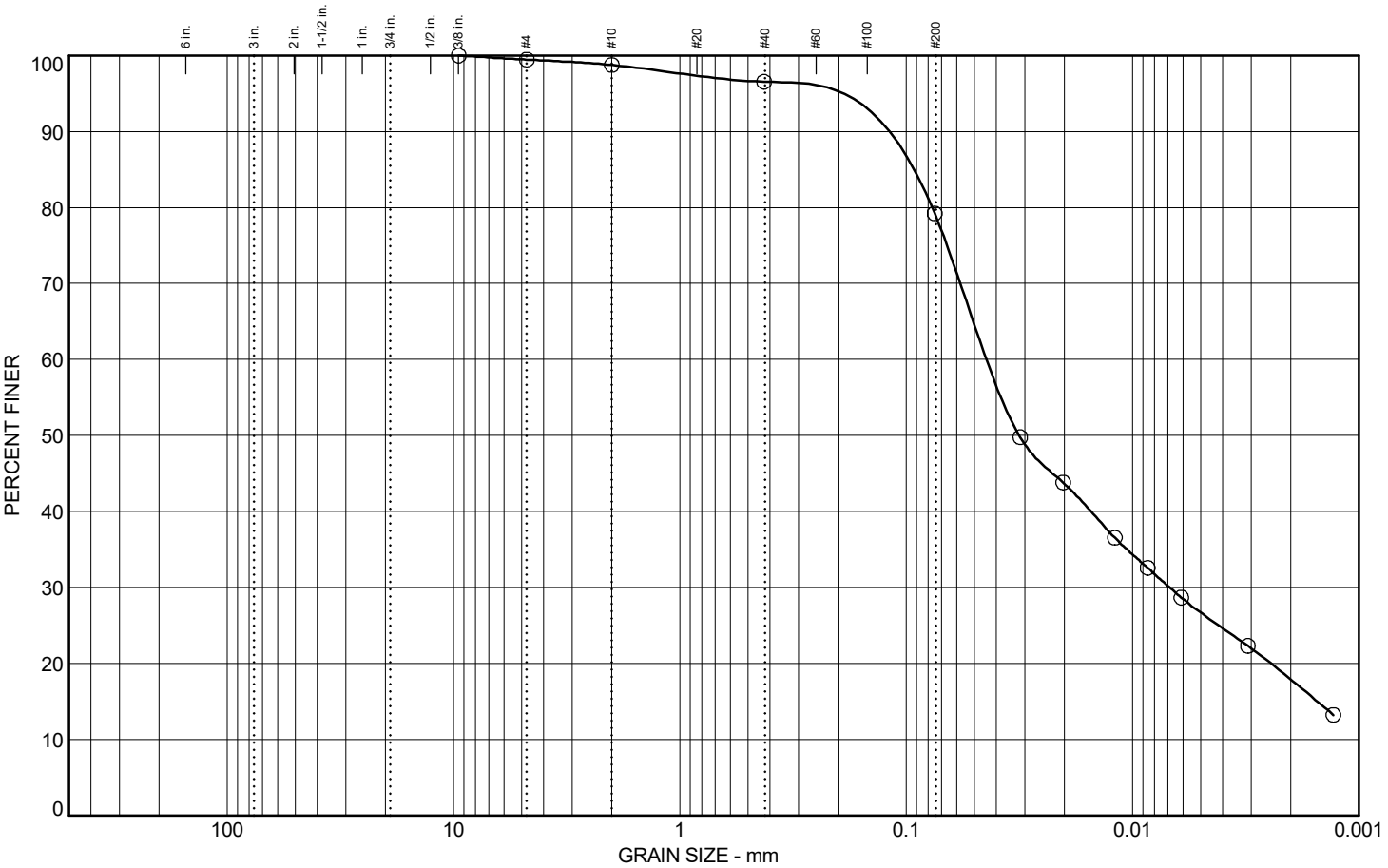
Group Index =

Sample No.: S-2 **Source of Sample:** B-03 **Date:**
Location: - **Depth / Elev:** 3.5' / 771.2'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.5	0.7	2.2	17.3	52.4	26.8

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5	100.0		
4.75	99.5		
2	98.8		
0.425	96.6		
0.075	79.2		

* (no specification provided)

Soil Description

low plasticity clay, fine sand

General Characteristics

Moisture Content = 11.5% Specific Gravity = 2.74

Atterberg Limits

LL= 16 PL= 10 PI= 6

Coefficients

D_{85}= 0.134 D_{60}= 0.043 D_{50}= 0.032
D_{30}= 0.007 D_{15}= 0.002 D_{10}=
C_u= C_c=

Classification

USCS = CL-ML AASHTO = A-4

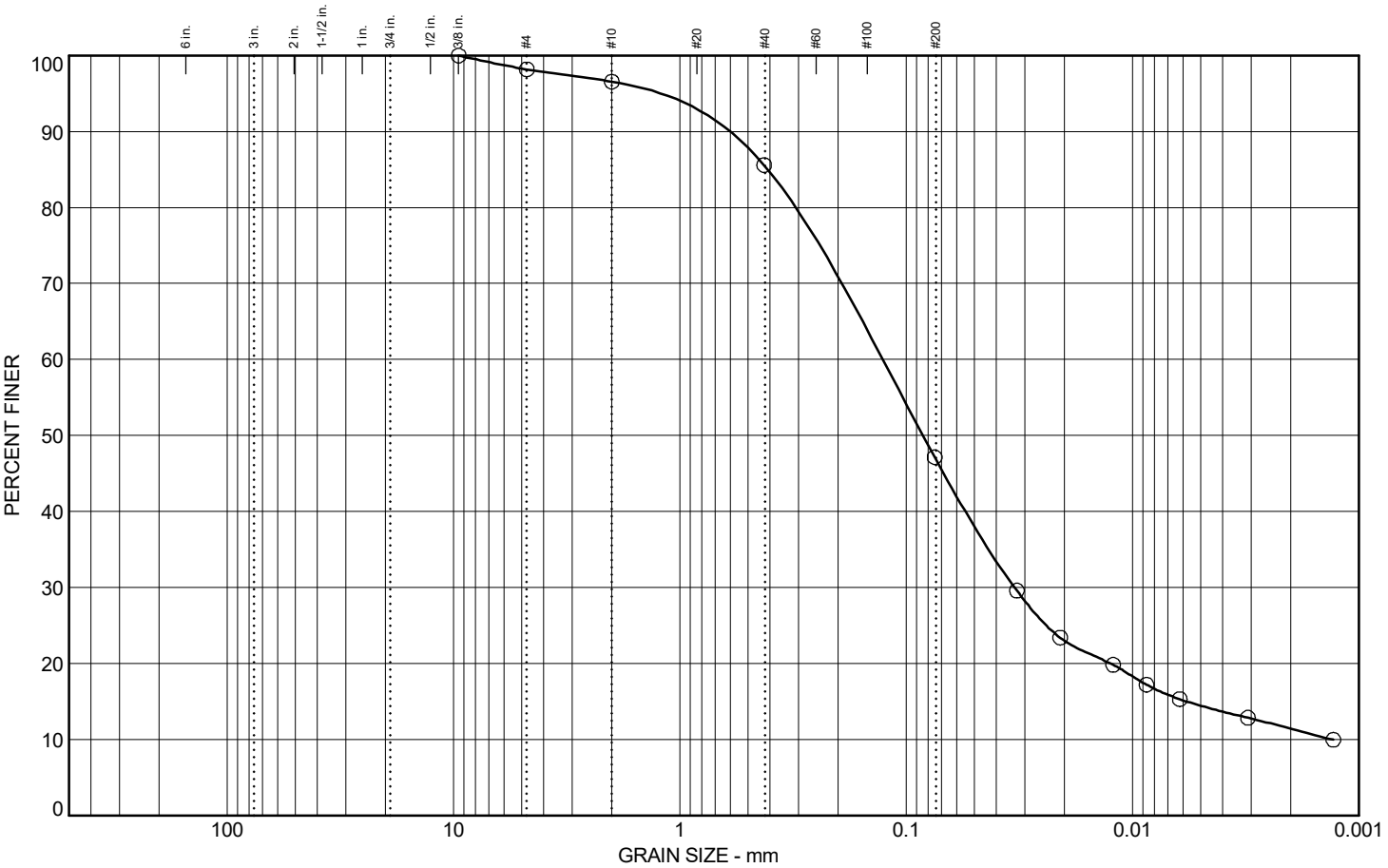
Remarks

Group Index = 1

Sample No.: S-5 **Source of Sample:** B-03 **Date:**
Location: - **Depth / Elev:** 11' / 763.7'

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.8	1.6	11.0	38.5	32.6	14.5

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5	100.0		
4.75	98.2		
2	96.6		
0.425	85.6		
0.075	47.1		

* (no specification provided)

Soil Description

fine sand, low plasticity silt

General Characteristics

Moisture Content = 14.6% Specific Gravity = 2.79

Atterberg Limits

LL= 15 PL= 14 PI= 1

Coefficients

D_{85}= 0.414 D_{60}= 0.134 D_{50}= 0.085
D_{30}= 0.033 D_{15}= 0.006 D_{10}= 0.001
C_u= 101.05 C_c= 6.19

Classification

USCS = SM AASHTO = A-4

Remarks

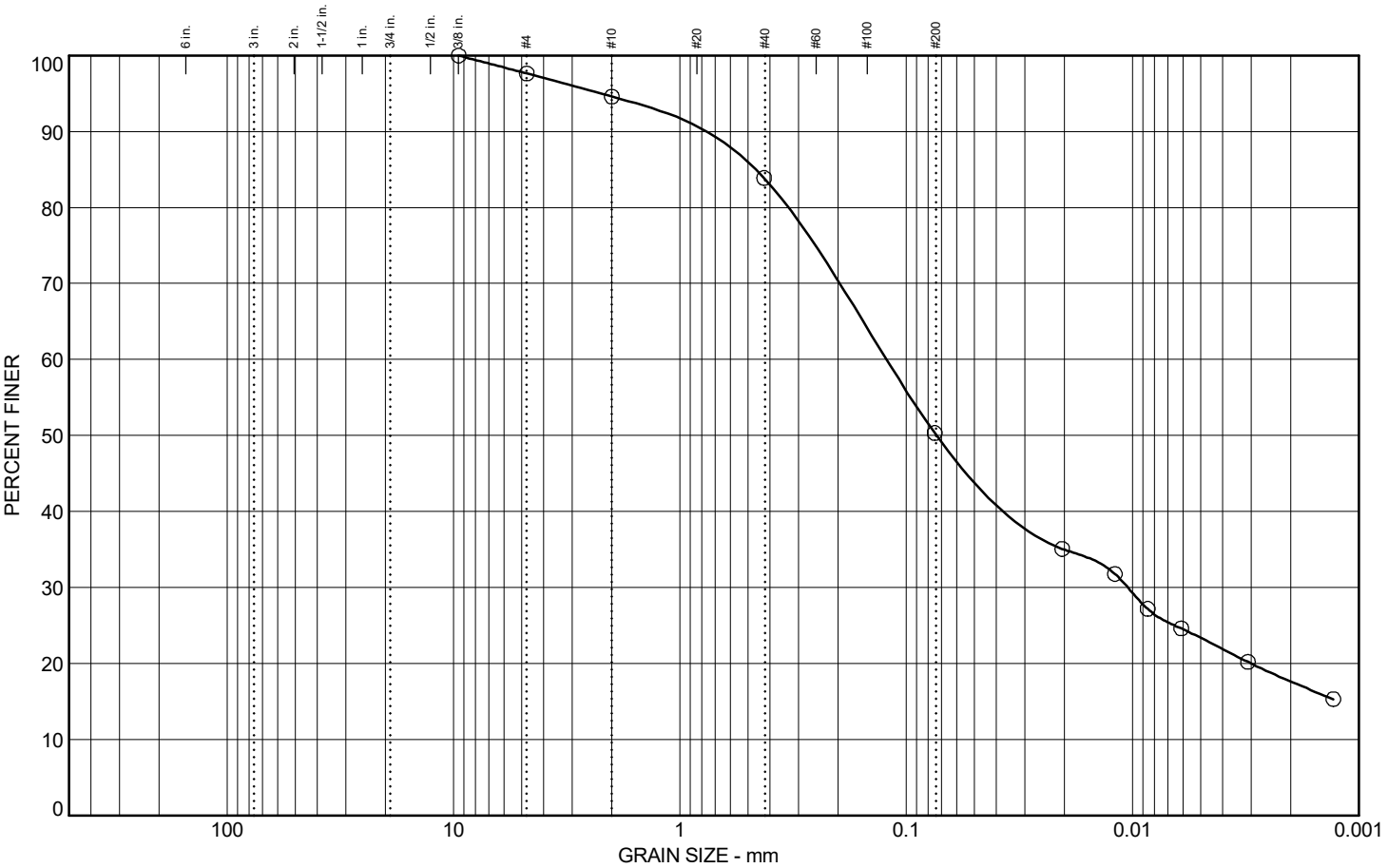
Group Index = 0

Sample No.: S-10 **Source of Sample:** B-03 **Date:**
Location: - **Depth / Elev:** 23.5' / 751.2'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	2.4	3.0	10.7	33.6	27.0	23.3

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5	100.0		
4.75	97.6		
2	94.6		
0.425	83.9		
0.075	50.3		

* (no specification provided)

Soil Description

low plasticity clay, fine sand

General Characteristics

Moisture Content = 7.7% Specific Gravity = 2.74

Atterberg Limits

LL= 20 PL= 10 PI= 10

Coefficients

D_{85}= 0.499 D_{60}= 0.124 D_{50}= 0.073
D_{30}= 0.011 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS = CL AASHTO = A-4

Remarks

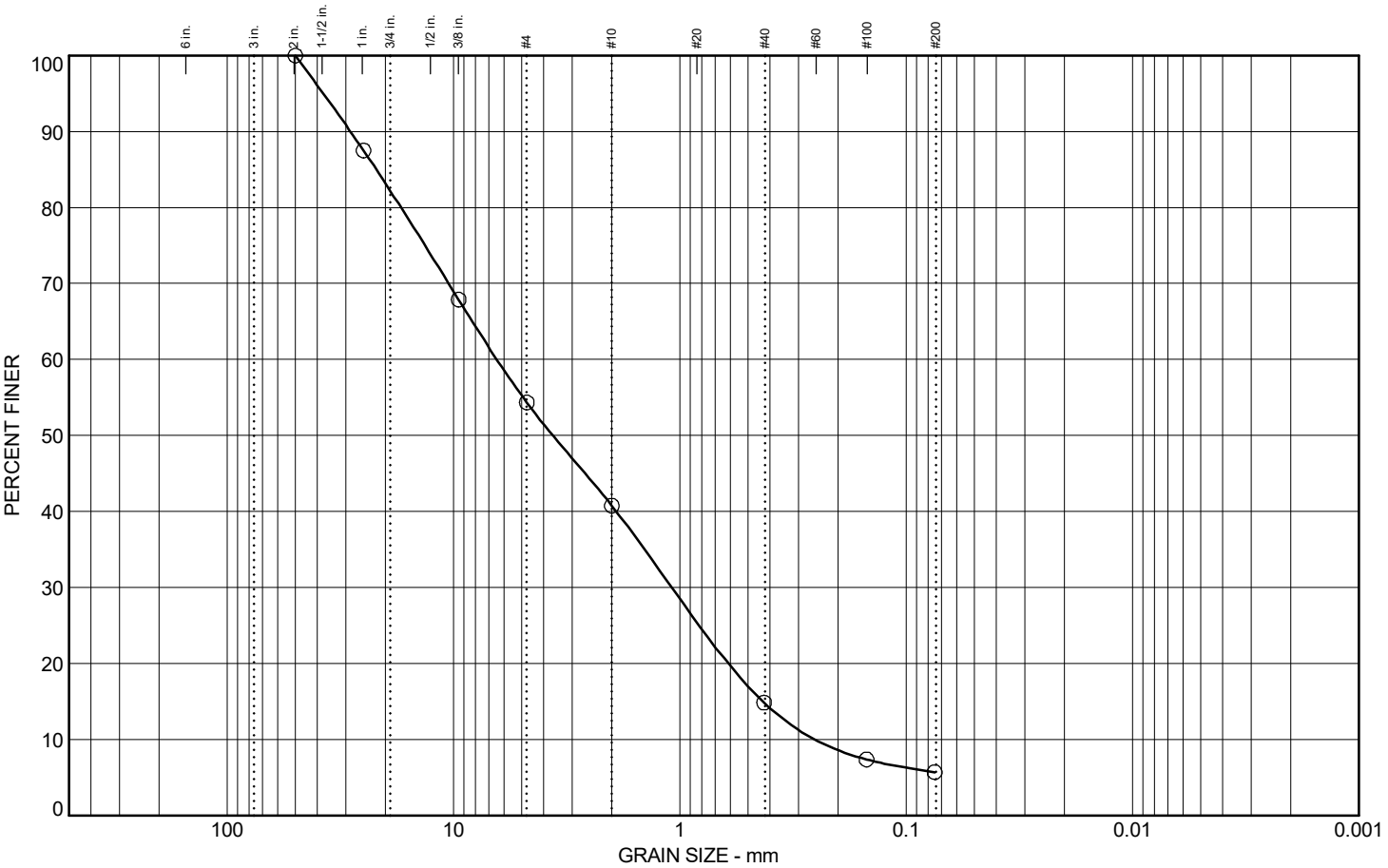
Group Index = 2

Sample No.: S-15 **Source of Sample:** B-03 **Date:**
Location: - **Depth / Elev:** 43.5' / 731.2'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	18.1	27.6	13.6	25.9	9.1	5.7	

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
50	100.0		
25	87.5		
9.5	67.9		
4.75	54.3		
2	40.8		
0.425	14.8		
0.15	7.4		
0.075	5.7		

* (no specification provided)

Soil Description

General Characteristics

Moisture Content = 6.2%

Atterberg Limits

LL= PL= PI=

Coefficients

D_{85}= 22.086 D_{60}= 6.348 D_{50}= 3.604
D_{30}= 1.052 D_{15}= 0.429 D_{10}= 0.217
C_u= 29.26 C_c= 0.80

Classification

USCS = AASHTO =

Remarks

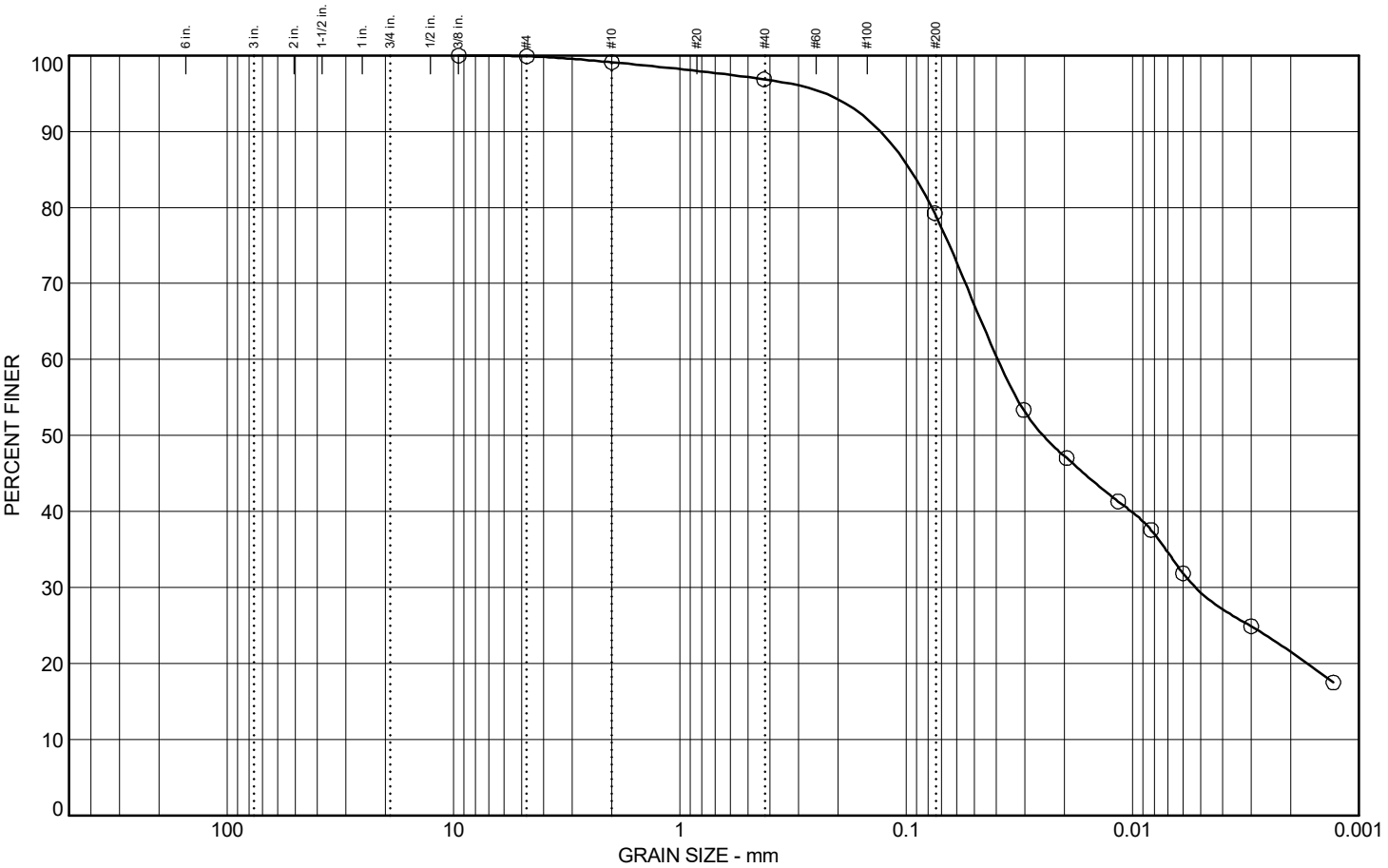
Group Index =

Sample No.: S-3 **Source of Sample:** B-04 **Date:**
Location: - **Depth / Elev:** 6' / 770.71'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.1	0.8	2.3	17.6	49.2	30.0

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5	100.0		
4.75	99.9		
2	99.1		
0.425	96.9		
0.075	79.3		

* (no specification provided)

Soil Description

low plasticity clay, fine sand

General Characteristics

Moisture Content = 12.2% Specific Gravity = 2.79

Atterberg Limits

LL= 21 PL= 14 PI= 7

Coefficients

D_{85}= 0.132 D_{60}= 0.038 D_{50}= 0.024
D_{30}= 0.005 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS = CL-ML AASHTO = A-4

Remarks

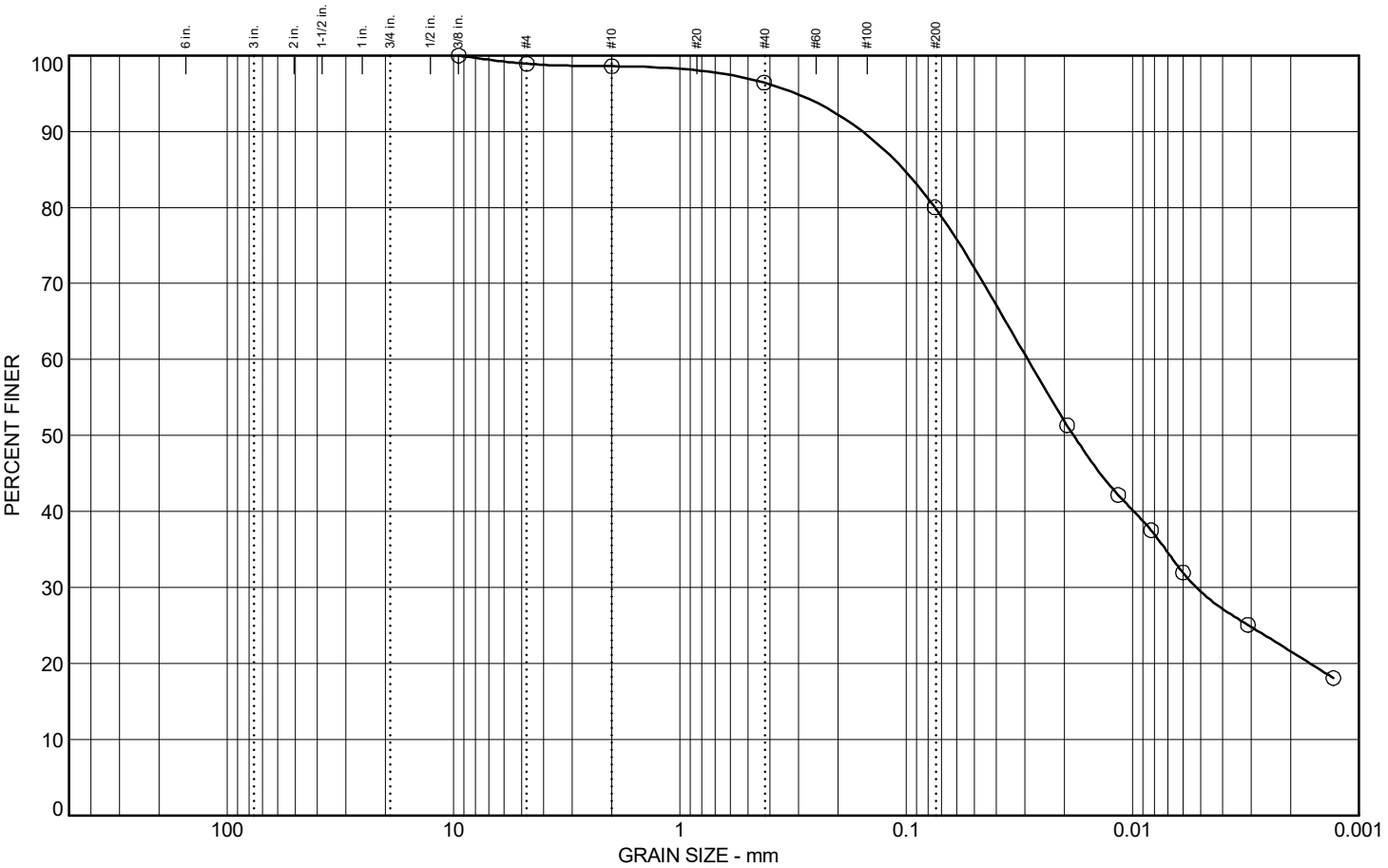
Group Index = 3

Sample No.: S-4 **Source of Sample:** B-04 **Date:**
Location: - **Depth / Elev:** 8.5' / 768.21'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.1	0.3	2.2	16.4	50.0	30.0

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5	100.0		
4.75	98.9		
2	98.6		
0.425	96.4		
0.075	80.0		

* (no specification provided)

Soil Description

low plasticity clay, fine sand

General Characteristics

Moisture Content = 11.9% Specific Gravity = 2.78

Atterberg Limits

LL= 22 PL= 14 PI= 8

Coefficients

D_{85}= 0.127 D_{60}= 0.029 D_{50}= 0.018
D_{30}= 0.005 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS = CL AASHTO = A-4

Remarks

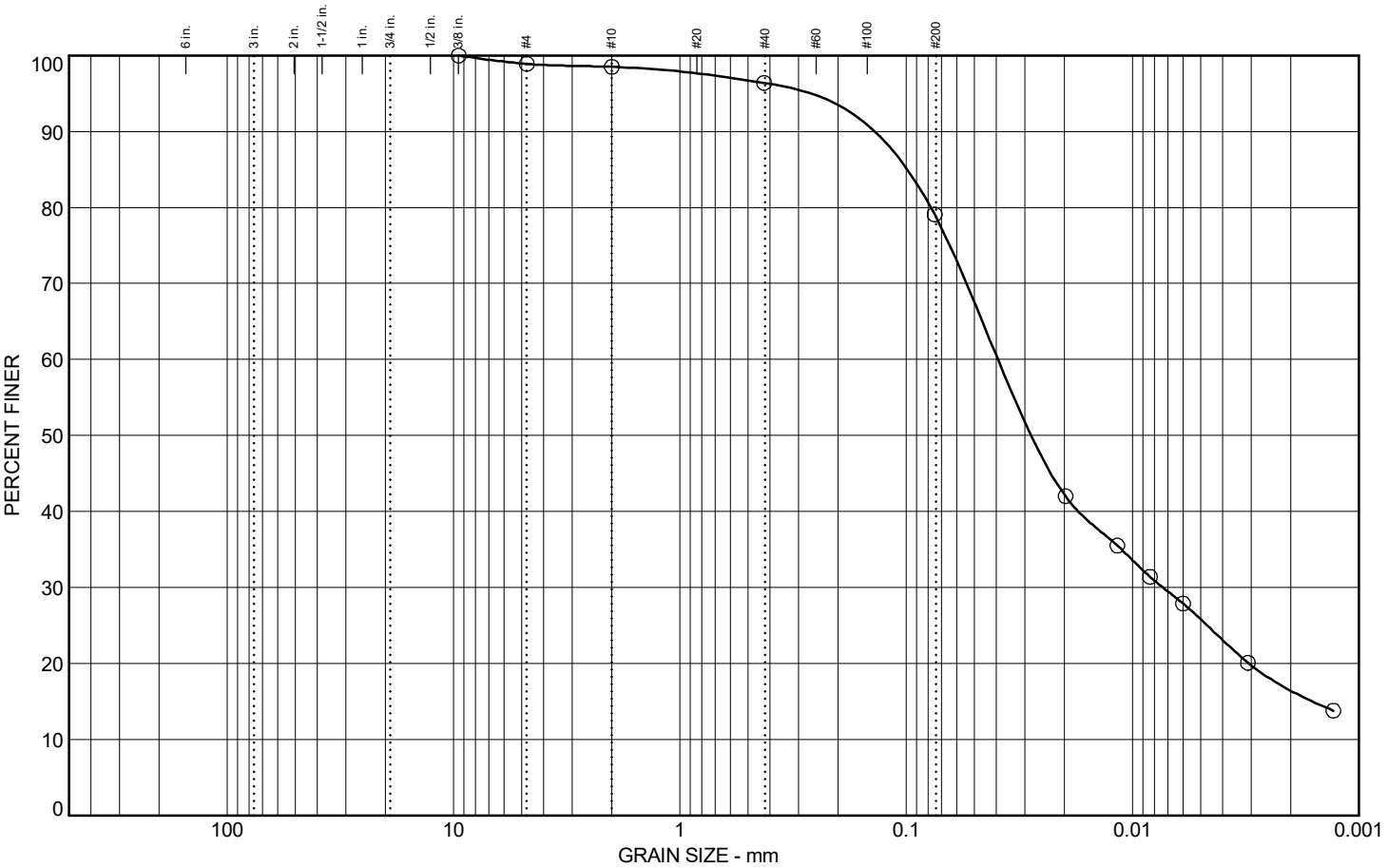
Group Index = 4

Sample No.: S-4 **Source of Sample:** B-05 **Date:**
Location: - **Depth / Elev:** 8.5' / 763.52'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.1	0.4	2.1	17.3	53.4	25.7

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5	100.0		
4.75	98.9		
2	98.5		
0.425	96.4		
0.075	79.1		

* (no specification provided)

Soil Description

low plasticity clay, fine sand

General Characteristics

Moisture Content = 11.4% Specific Gravity = 2.76

Atterberg Limits

LL= 19 PL= 13 PI= 6

Coefficients

D_{85}= 0.136 D_{60}= 0.038 D_{50}= 0.026
D_{30}= 0.007 D_{15}= 0.002 D_{10}=
C_u= C_c=

Classification

USCS = CL-ML AASHTO = A-4

Remarks

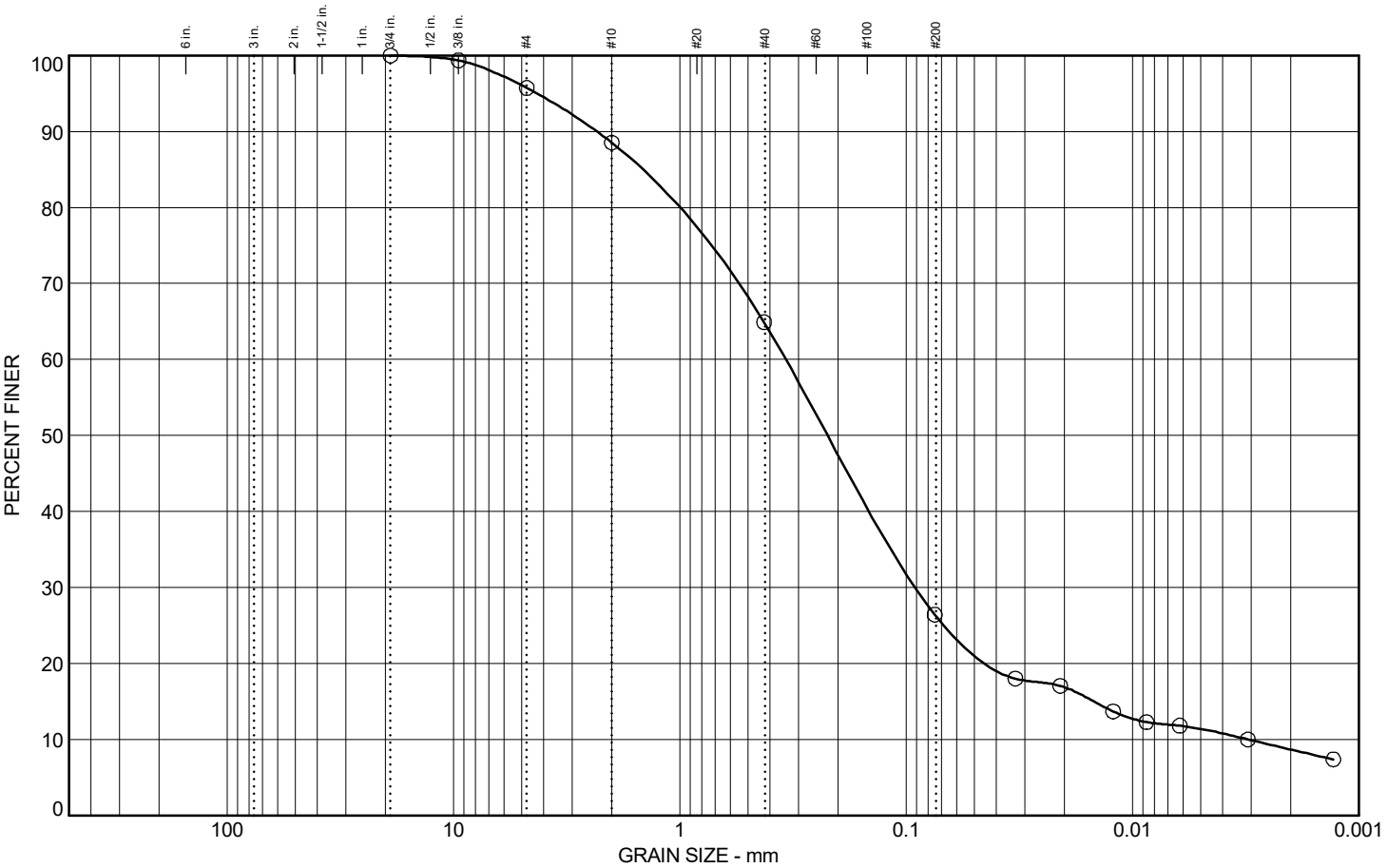
Group Index = 2

Sample No.: ST-1 **Source of Sample:** B-05 **Date:**
Location: - **Depth / Elev:** 12.5' / 759.52'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	4.3	7.2	23.6	38.5	15.2	11.2

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19	100.0		
9.5	99.4		
4.75	95.7		
2	88.5		
0.425	64.9		
0.075	26.4		

* (no specification provided)

Soil Description

General Characteristics

Moisture Content = 13.2% Specific Gravity = 2.79

Atterberg Limits

LL= PL= PI=

Coefficients

D_{85}= 1.586 D_{60}= 0.341 D_{50}= 0.217
D_{30}= 0.088 D_{15}= 0.015 D_{10}= 0.003
C_u= 109.00 C_c= 7.29

Classification

USCS = AASHTO =

Remarks

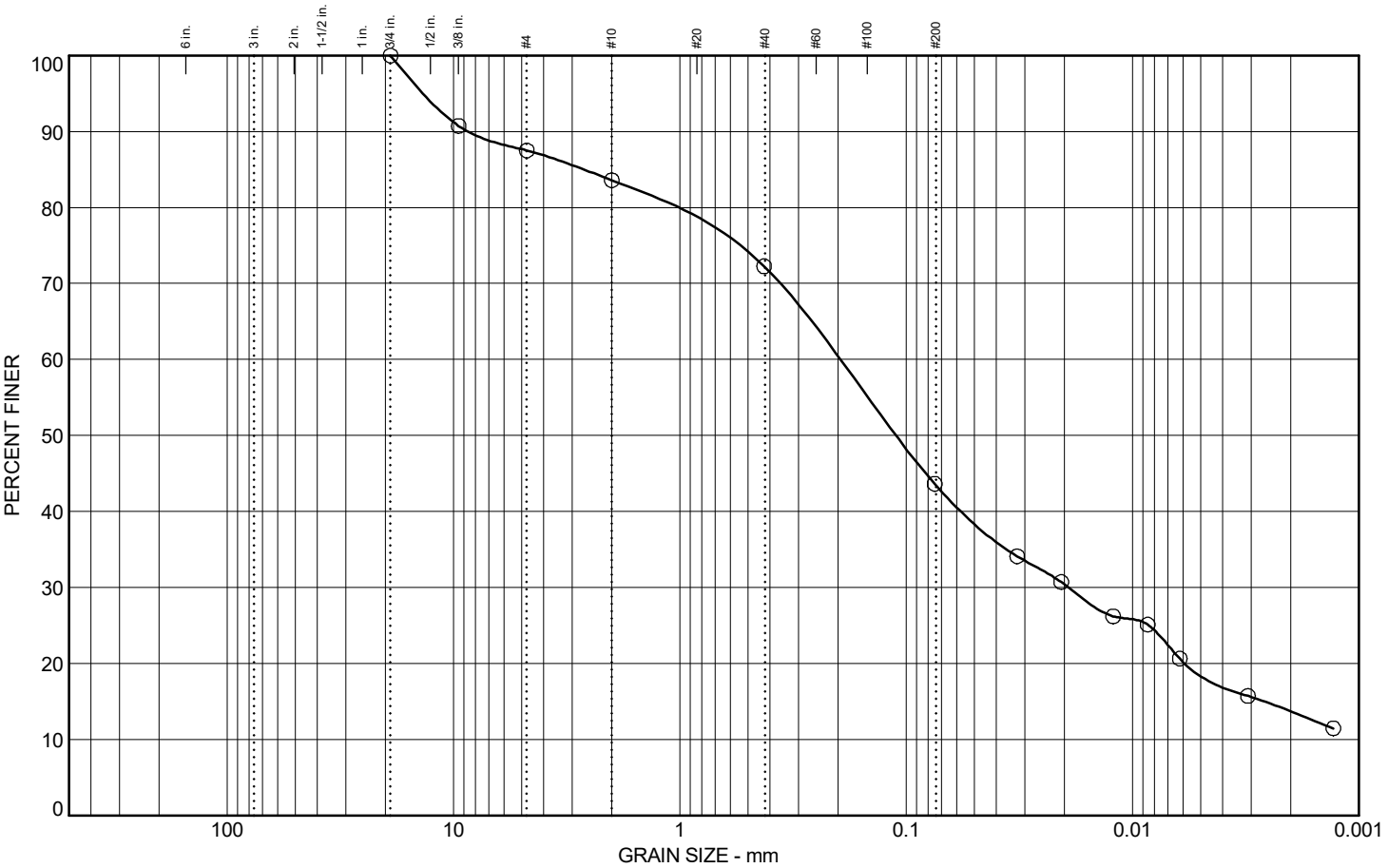
Group Index =

Sample No.: S-9 **Source of Sample:** B-05 **Date:**
Location: - **Depth / Elev:** 26' / 746.02'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	12.5	3.9	11.3	28.6	24.5	19.1

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19	100.0		
9.5	90.7		
4.75	87.5		
2	83.6		
0.425	72.3		
0.075	43.6		

* (no specification provided)

Soil Description

fine to medium sand, low plasticity clay

General Characteristics

Moisture Content = 6.9% Specific Gravity = 2.7

Atterberg Limits

LL= 17 PL= 11 PI= 6

Coefficients

D_{85}= 2.731 D_{60}= 0.202 D_{50}= 0.11
D_{30}= 0.019 D_{15}= 0.003 D_{10}=
C_u= C_c=

Classification

USCS = SC-SM AASHTO = A-4

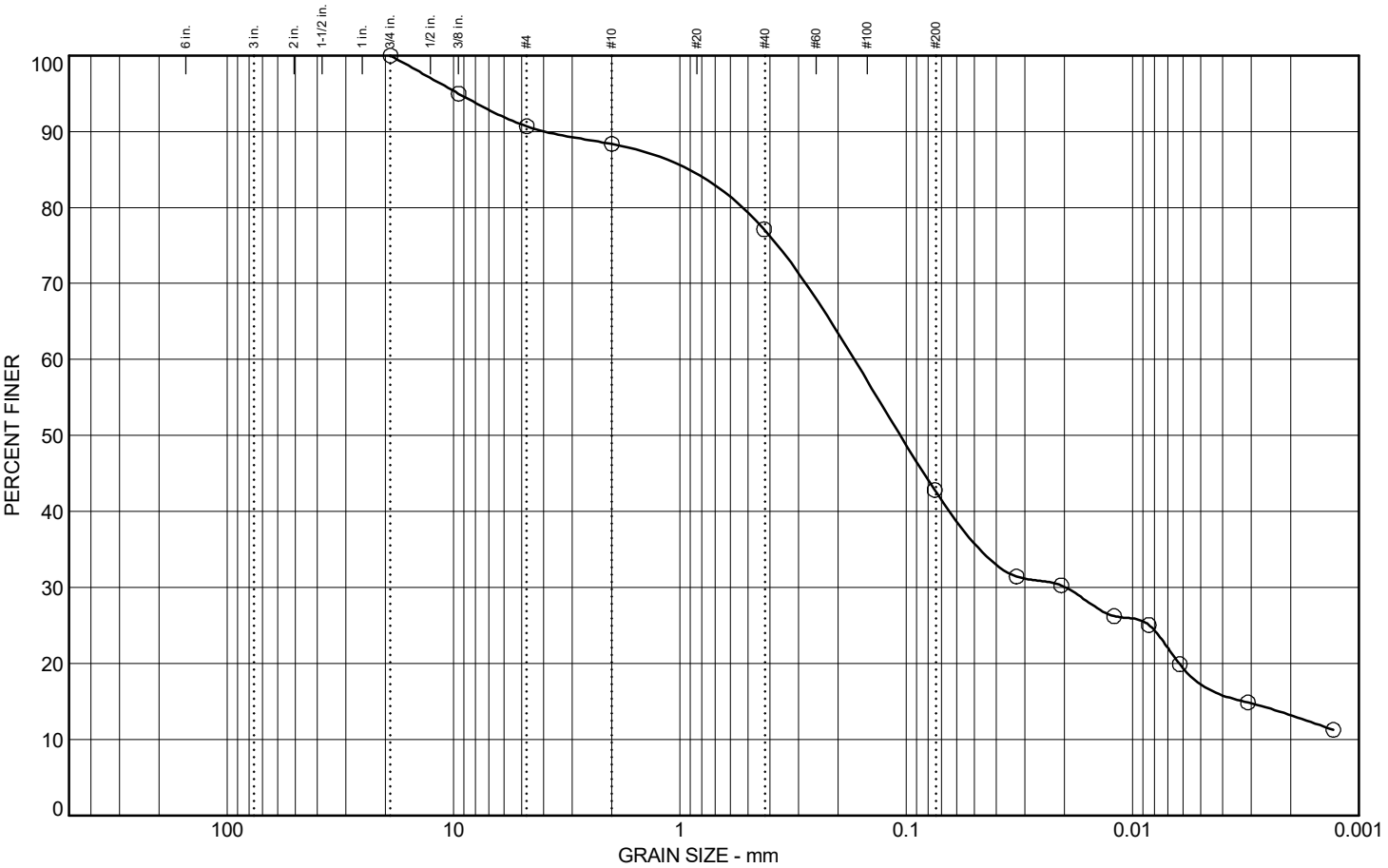
Remarks

Group Index = 0

Sample No.: S-13 **Source of Sample:** B-05 **Date:**
Location: - **Depth / Elev:** 43.5' / 728.52'

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	9.3	2.3	11.2	34.3	24.5	18.3

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19	100.0		
9.5	95.0		
4.75	90.7		
2	88.4		
0.425	77.1		
0.075	42.8		

* (no specification provided)

Soil Description

fine sand, low plasticity clay

General Characteristics

Moisture Content = 13.6% Specific Gravity = 2.77

Atterberg Limits

LL= 21 PL= 14 PI= 7

Coefficients

D_{85}= 1.258 D_{60}= 0.179 D_{50}= 0.108
D_{30}= 0.02 D_{15}= 0.003 D_{10}=
C_u= C_c=

Classification

USCS = SC-SM AASHTO = A-4

Remarks

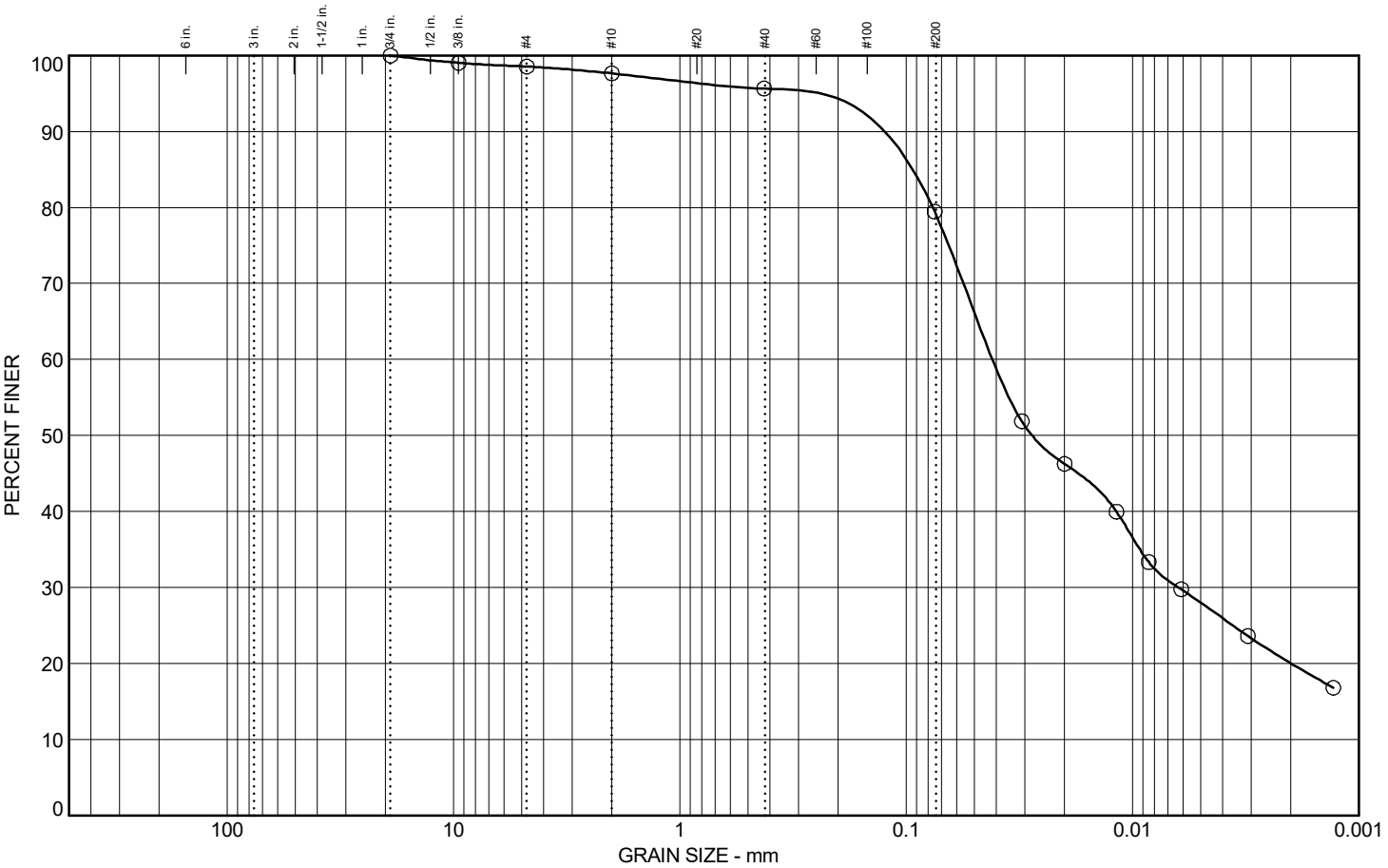
Group Index = 0

Sample No.: S-2 **Source of Sample:** B-06 **Date:**
Location: - **Depth / Elev:** 3.5' / 778.54'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.5	0.9	2.0	16.2	51.5	27.9

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19	100.0		
9.5	99.0		
4.75	98.5		
2	97.7		
0.425	95.7		
0.075	79.5		

* (no specification provided)

Soil Description

low plasticity clay, fine sand

General Characteristics

Moisture Content = 11.7% Specific Gravity = 2.76

Atterberg Limits

LL= 23 PL= 12 PI= 11

Coefficients

D_{85}= 0.136 D_{60}= 0.04 D_{50}= 0.027
D_{30}= 0.006 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS = CL AASHTO = A-6

Remarks

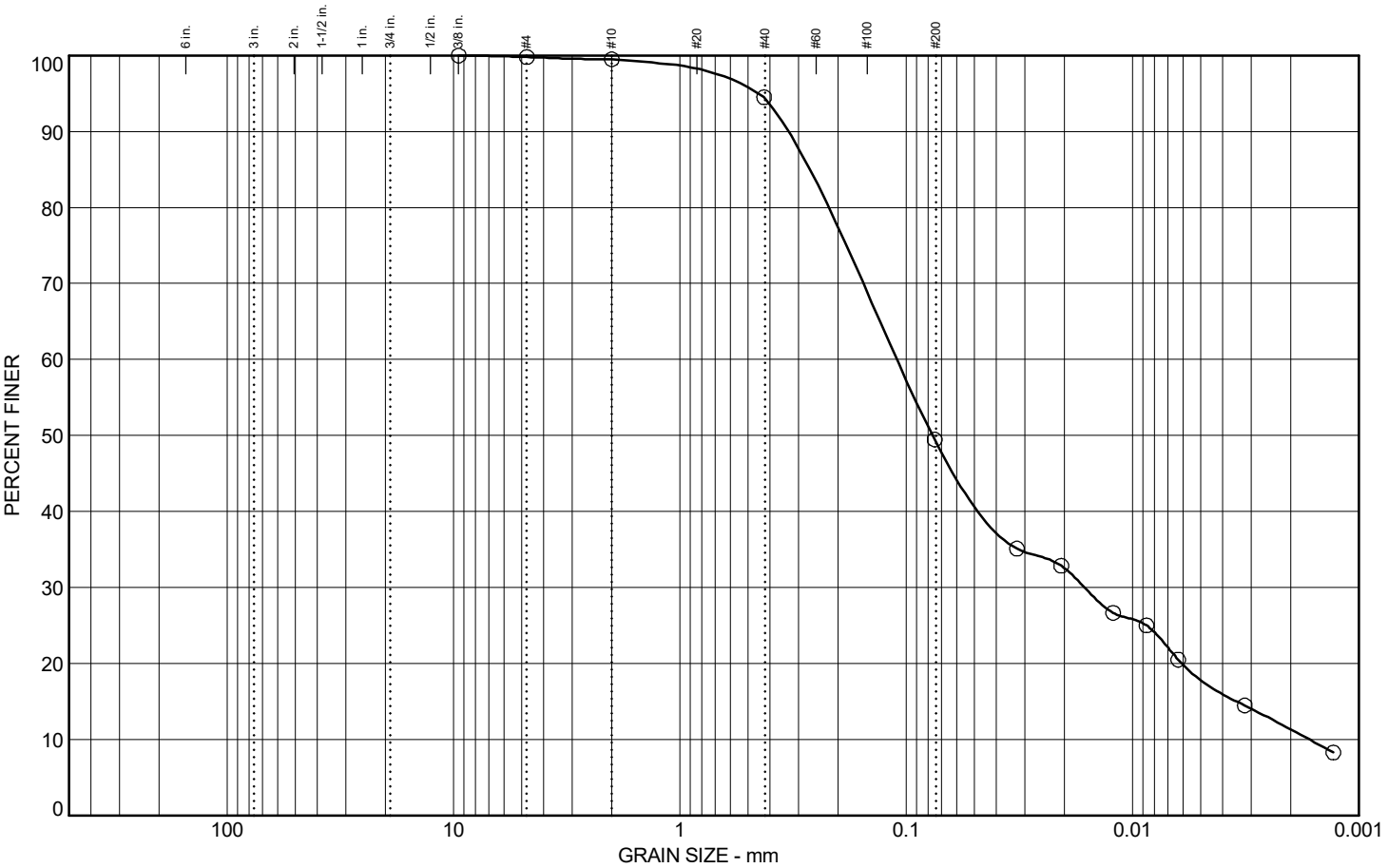
Group Index = 6

Sample No.: S-5 **Source of Sample:** B-06 **Date:**
Location: - **Depth / Elev:** 13.5' / 768.54'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.2	0.3	5.0	45.1	31.0	18.4

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5	100.0		
4.75	99.8		
2	99.5		
0.425	94.5		
0.075	49.4		

* (no specification provided)

Soil Description

General Characteristics

Moisture Content = 13.0% Specific Gravity = 2.72

Atterberg Limits

LL= PL= PI=

Coefficients

D_{85}= 0.295 D_{60}= 0.113 D_{50}= 0.077
D_{30}= 0.016 D_{15}= 0.003 D_{10}= 0.002
C_u= 67.17 C_c= 1.40

Classification

USCS = AASHTO =

Remarks

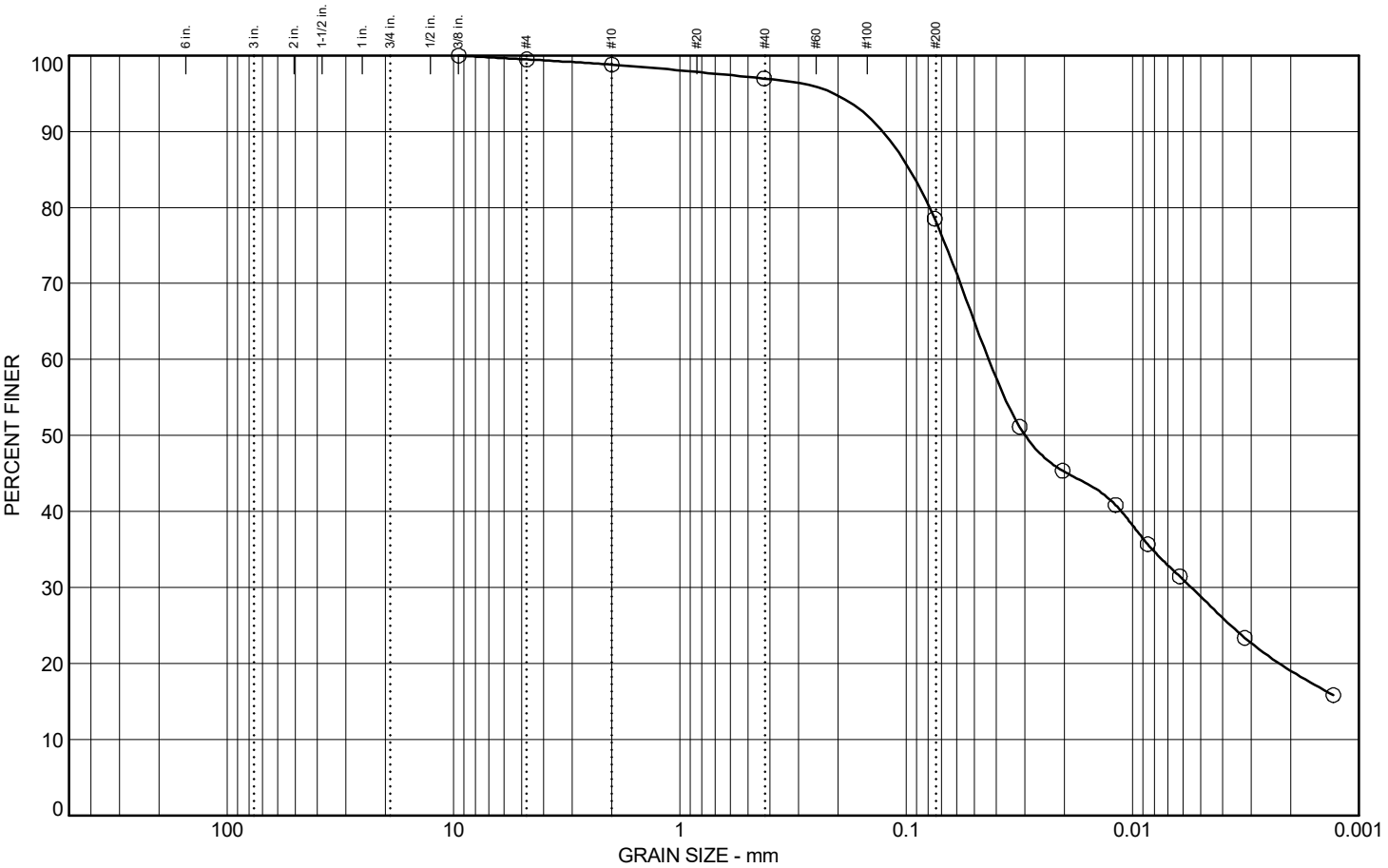
Group Index =

Sample No.: S-1 **Source of Sample:** B-07 **Date:**
Location: - **Depth / Elev:** 1' / 777.86'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.5	0.7	1.8	18.5	49.7	28.8

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5	100.0		
4.75	99.5		
2	98.8		
0.425	97.0		
0.075	78.5		

* (no specification provided)

Soil Description

low plasticity clay, fine sand

General Characteristics

Moisture Content = 11.0% Specific Gravity = 2.68

Atterberg Limits

LL= 20 PL= 14 PI= 6

Coefficients

D_{85}= 0.138 D_{60}= 0.042 D_{50}= 0.029
D_{30}= 0.006 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS = CL-ML AASHTO = A-4

Remarks

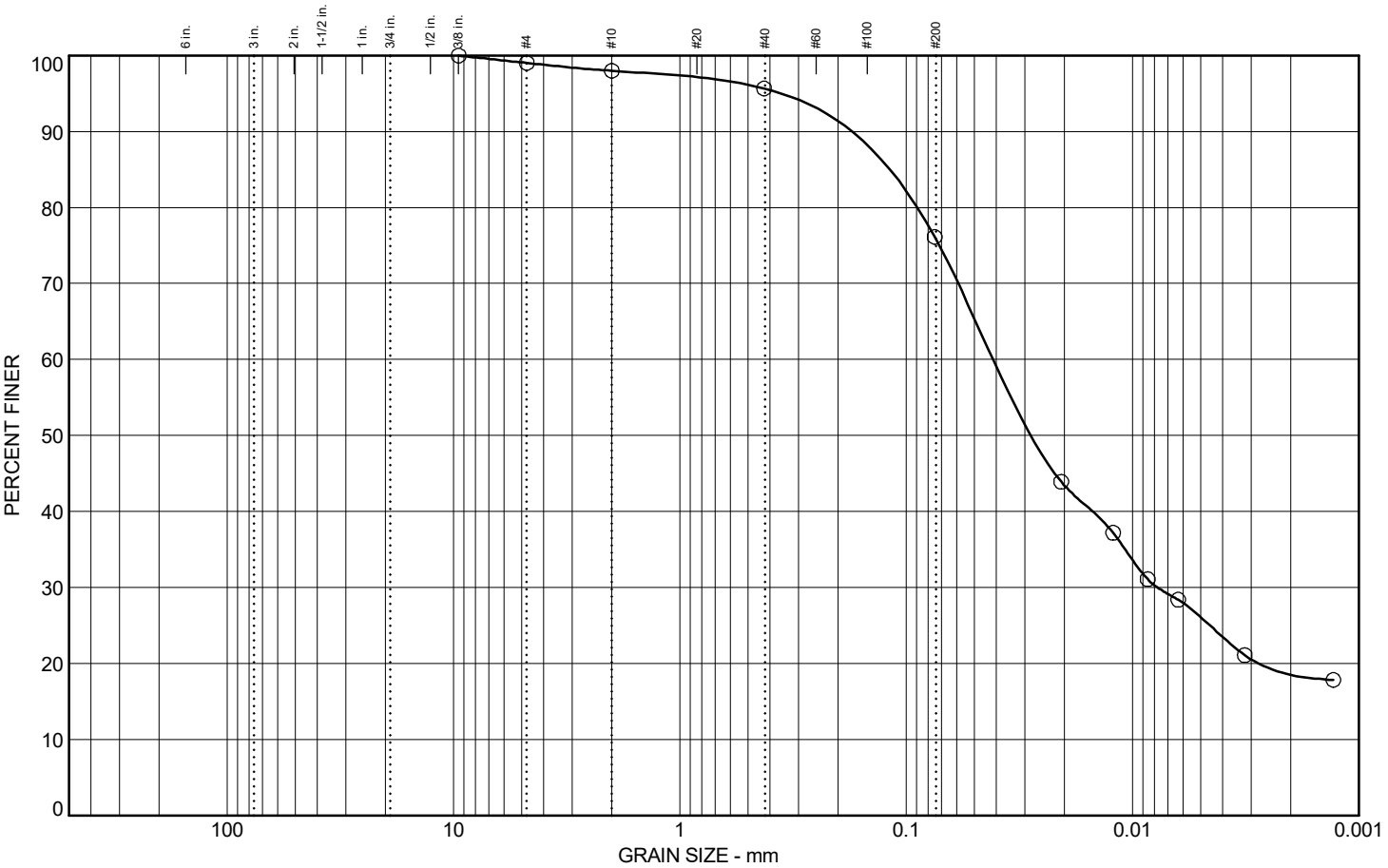
Group Index = 2

Sample No.: S-4 **Source of Sample:** B-07 **Date:**
Location: - **Depth / Elev:** 8.5' / 770.36'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.0	1.0	2.3	19.5	50.2	25.9

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5	100.0		
4.75	99.0		
2	98.0		
0.425	95.7		
0.075	76.1		

* (no specification provided)

Soil Description

low plasticity clay, fine sand

General Characteristics

Moisture Content = 10.8% Specific Gravity = 2.7

Atterberg Limits

LL= 18 PL= 13 PI= 5

Coefficients

D_{85}= 0.165 D_{60}= 0.039 D_{50}= 0.026
D_{30}= 0.008 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS = CL-ML AASHTO = A-4

Remarks

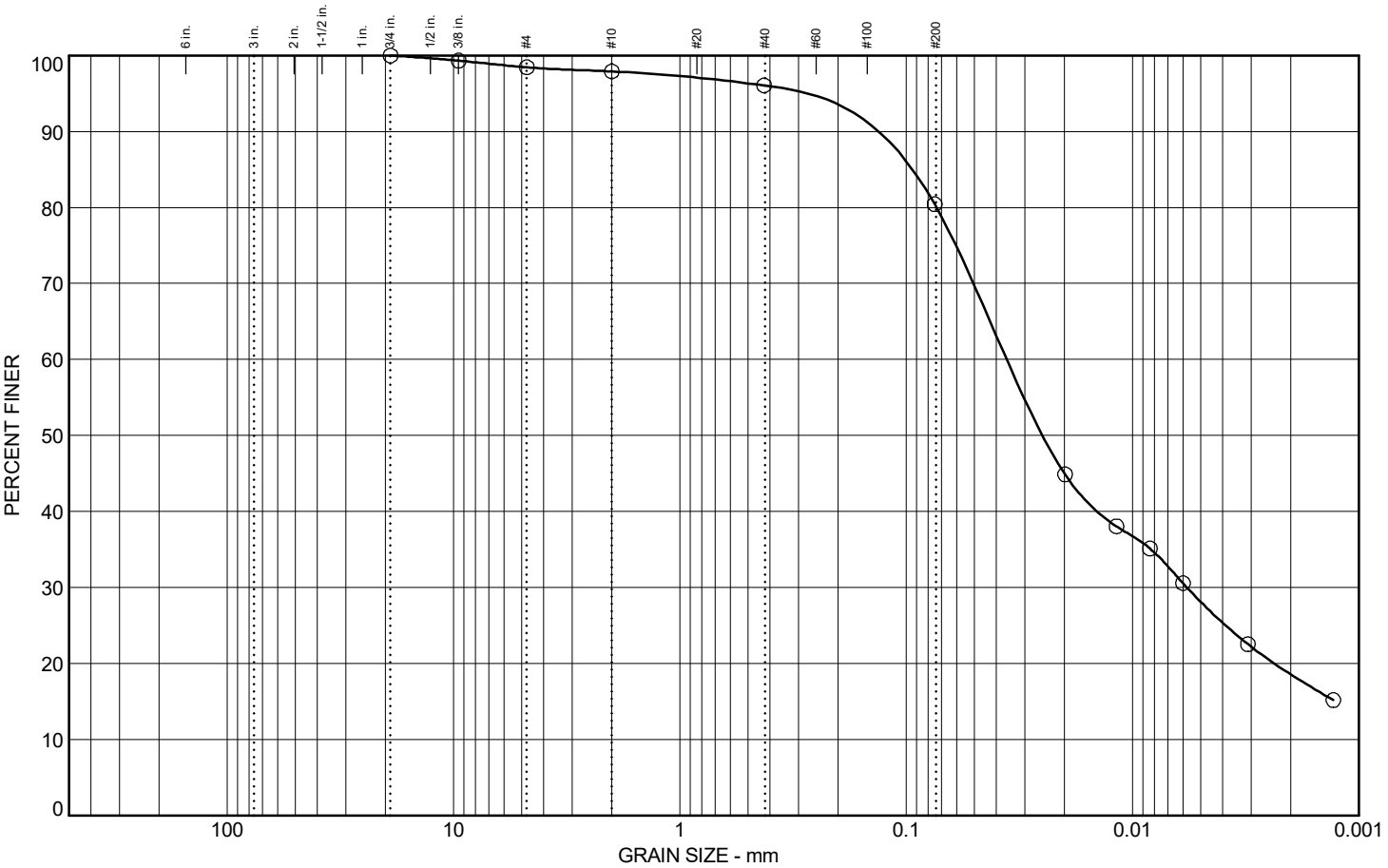
Group Index = 1

Sample No.: ST-1 **Source of Sample:** B-07 **Date:**
Location: - **Depth / Elev:** 16' / 762.86'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.5	0.6	1.8	15.6	52.1	28.3

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19	100.0		
9.5	99.3		
4.75	98.5		
2	97.9		
0.425	96.1		
0.075	80.4		

* (no specification provided)

Soil Description

low plasticity clay, fine sand

General Characteristics

Moisture Content = 11.4% Specific Gravity = 2.79

Atterberg Limits

LL= 20 PL= 13 PI= 7

Coefficients

D_{85}= 0.124 D_{60}= 0.035 D_{50}= 0.024
D_{30}= 0.006 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS = CL-ML AASHTO = A-4

Remarks

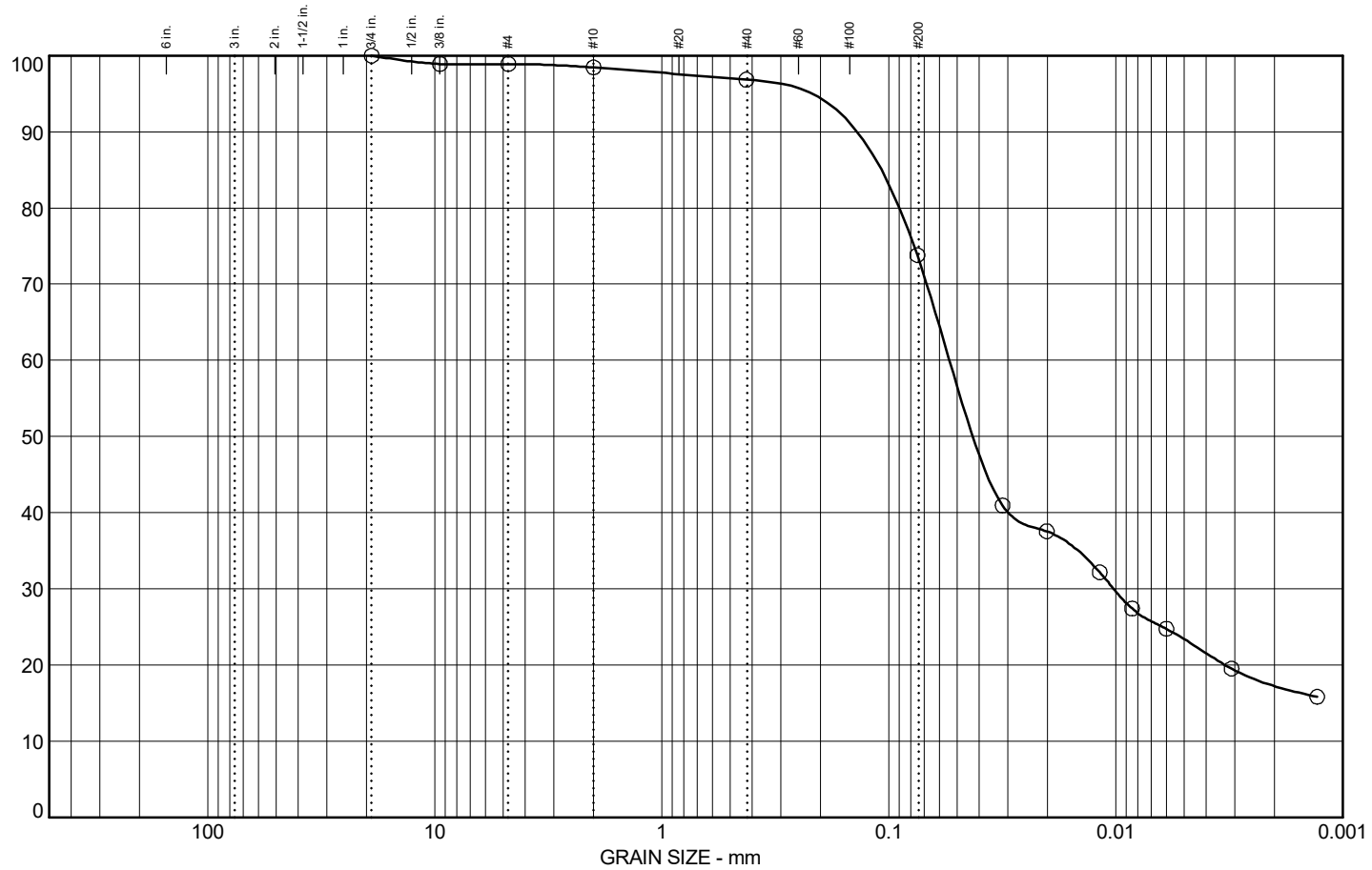
Group Index = 3

Sample No.: ST-2 **Source of Sample:** B-07 **Date:**
Location: - **Depth / Elev:** 21' / 757.86'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.1	0.4	1.6	23.0	50.5	23.3

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19	100.0		
9.5	98.9		
4.75	98.9		
2	98.5		
0.425	96.8		
0.075	73.8		

* (no specification provided)

Soil Description

low plasticity silt, fine sand

General Characteristics

Moisture Content = 13.3% Specific Gravity = 2.79

Atterberg Limits

LL= 16 PL= 13 PI= 3

Coefficients

D_{85}= 0.174 D_{60}= 0.052 D_{50}= 0.04
D_{30}= 0.01 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS = ML AASHTO = A-4

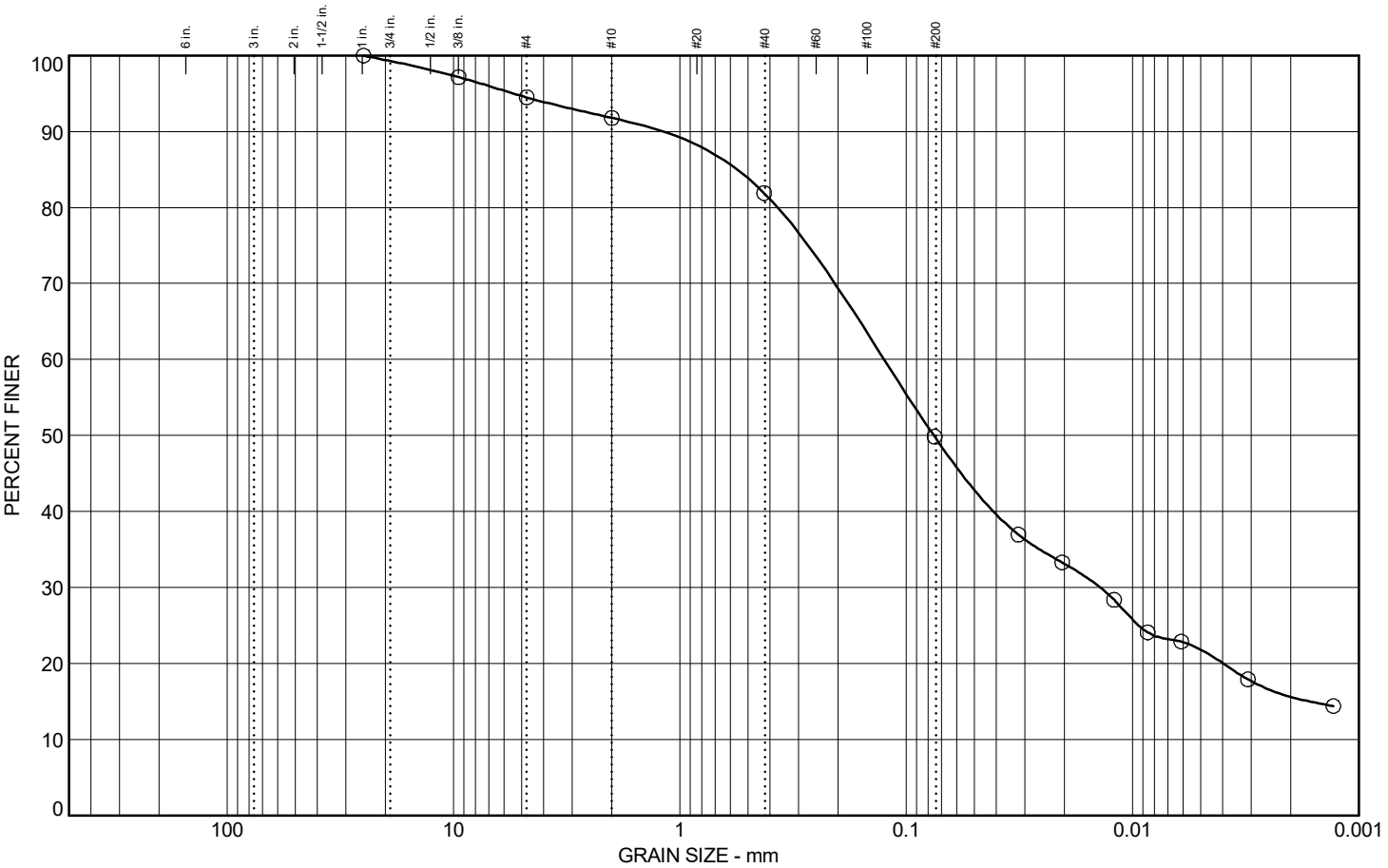
Remarks

Group Index = 0

Sample No.: S-8 **Source of Sample:** B-07 **Date:**
Location: - **Depth / Elev:** 23.5' / 755.36'

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.8	4.7	2.7	9.9	32.1	28.4	21.4

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
25	100.0		
9.5	97.2		
4.75	94.5		
2	91.8		
0.425	81.9		
0.075	49.8		

* (no specification provided)

Soil Description

fine sand, low plasticity clay

General Characteristics

Moisture Content = 9.2% Specific Gravity = 2.77

Atterberg Limits

LL= 15 PL= 11 PI= 4

Coefficients

D_{85}= 0.69 D_{60}= 0.13 D_{50}= 0.076
D_{30}= 0.014 D_{15}= 0.002 D_{10}=
C_u= C_c=

Classification

USCS = SC-SM AASHTO = A-4

Remarks

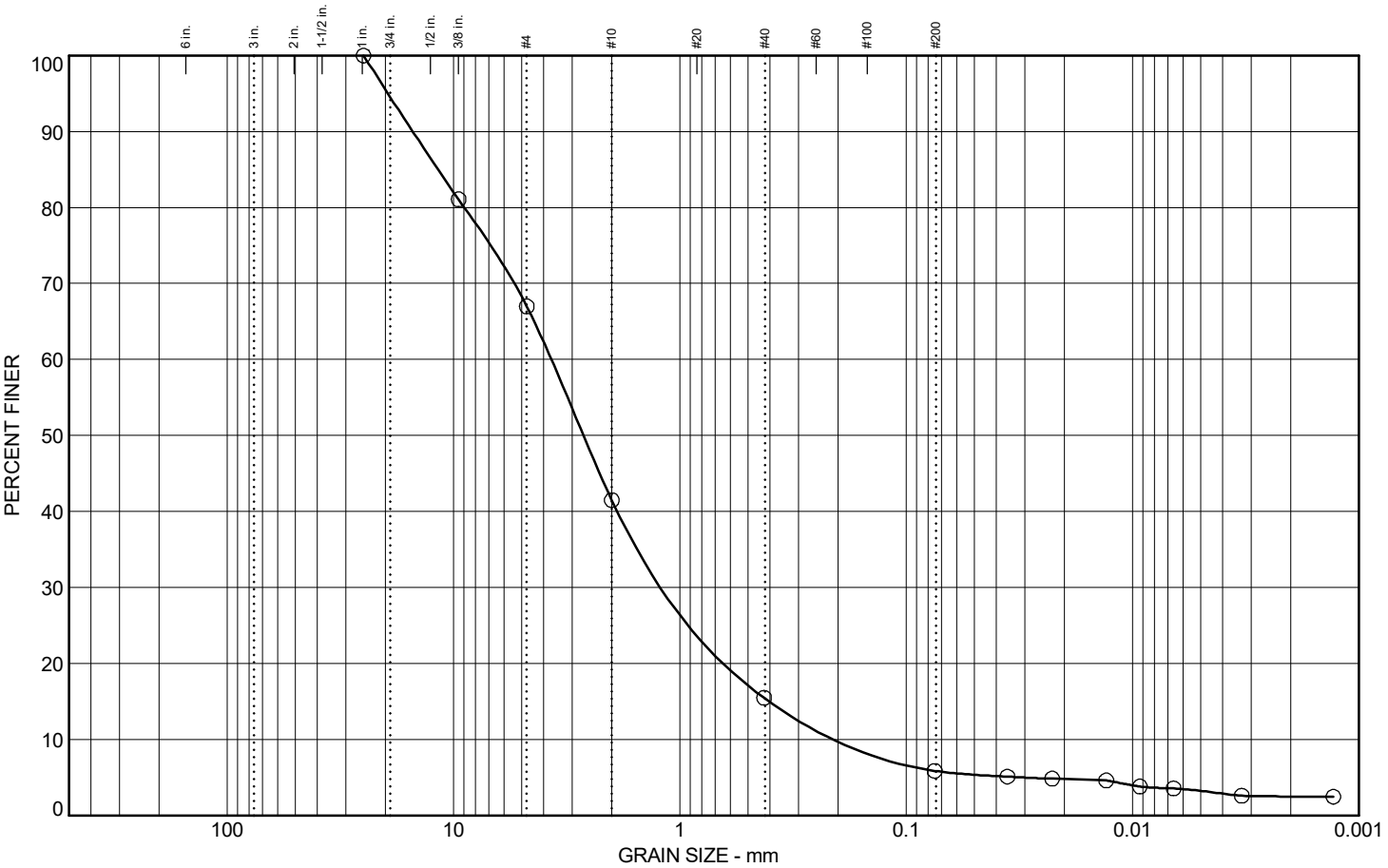
Group Index = 0

Sample No.: S-12 **Source of Sample:** B-07 **Date:**
Location: - **Depth / Elev:** 38.5' / 740.36'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	5.4	27.7	25.5	26.0	9.6	2.7	3.1

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
25	100.0		
9.5	81.1		
4.75	67.0		
2	41.5		
0.425	15.5		
0.075	5.8		

* (no specification provided)

Soil Description

General Characteristics

Moisture Content = 3.8% Specific Gravity = 2.74

Atterberg Limits

LL= PL= PI=

Coefficients

D_{85}= 11.615 D_{60}= 3.749 D_{50}= 2.67
D_{30}= 1.01 D_{15}= 0.391 D_{10}= 0.159
C_u= 23.61 C_c= 1.71

Classification

USCS = AASHTO =

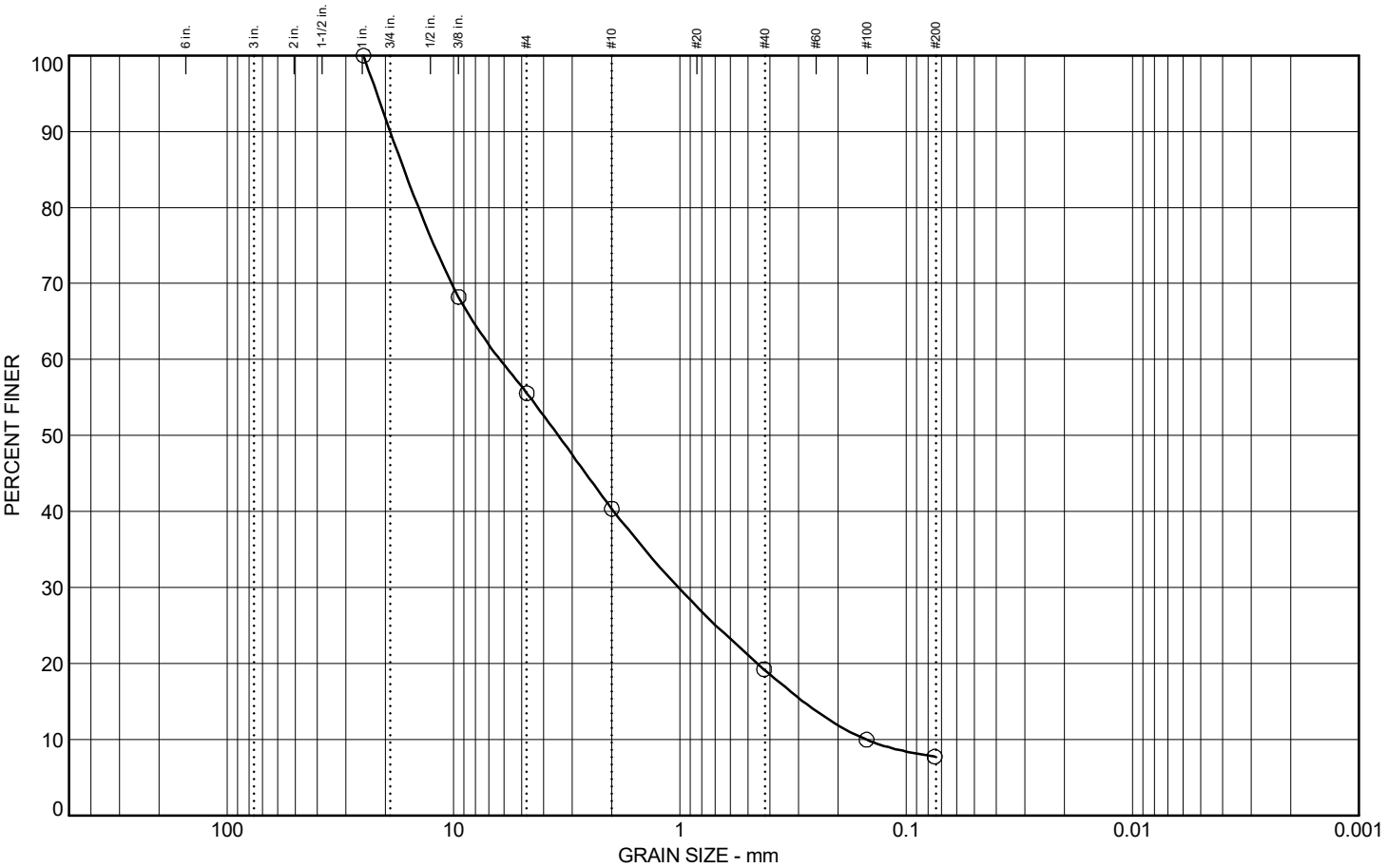
Remarks

Group Index =

Sample No.: Bulk-1 **Source of Sample:** B-08 **Date:**
Location: - **Depth / Elev:** 0.5' / 792.69'

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	9.0	35.4	15.2	21.1	11.5	7.7	

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
25	100.0		
9.5	68.2		
4.75	55.6		
2	40.4		
0.425	19.2		
0.15	10.0		
0.075	7.7		

* (no specification provided)

Soil Description

General Characteristics

Moisture Content = 2.9%

Atterberg Limits

LL= PL= PI=

Coefficients

D_{85}= 15.831 D_{60}= 6.057 D_{50}= 3.463
D_{30}= 0.937 D_{15}= 0.265 D_{10}= 0.151
C_u= 40.16 C_c= 0.96

Classification

USCS = AASHTO =

Remarks

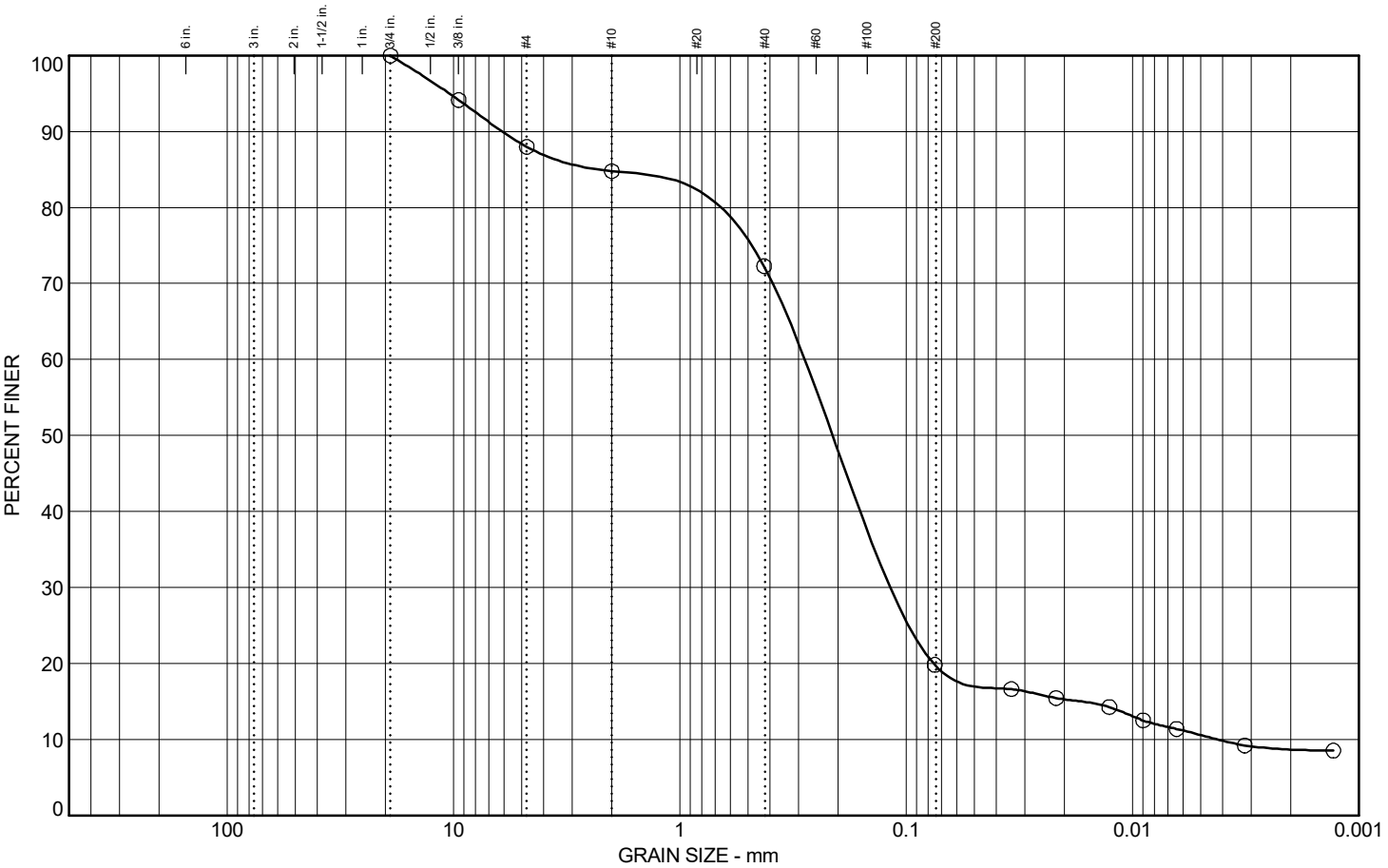
Group Index =

Sample No.: S-3 **Source of Sample:** B-08 **Date:**
Location: - **Depth / Elev:** 6' / 787.19'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	12.0	3.2	12.5	52.5	9.2	10.6

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19	100.0		
9.5	94.2		
4.75	88.0		
2	84.8		
0.425	72.3		
0.075	19.8		

* (no specification provided)

Soil Description

fine sand, low plasticity silt

General Characteristics

Moisture Content = 9.8% Specific Gravity = 2.76

Atterberg Limits

LL= 16 PL= 16 PI= 0

Coefficients

D_{85}= 2.124 D_{60}= 0.283 D_{50}= 0.203
D_{30}= 0.105 D_{15}= 0.018 D_{10}= 0.004
C_u= 68.28 C_c= 9.40

Classification

USCS = SM AASHTO = A-2-4

Remarks

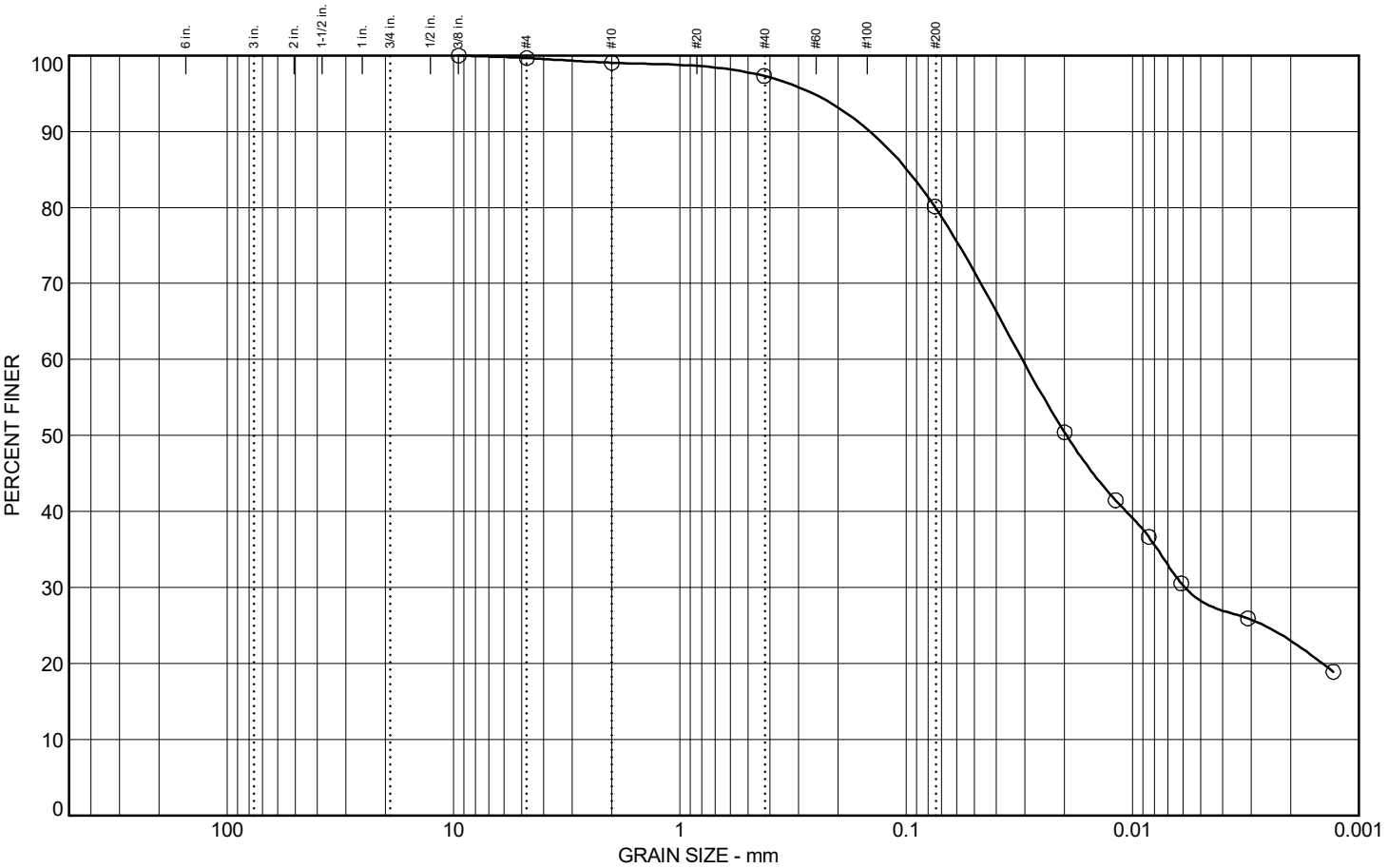
Group Index = 0

Sample No.: S-7 **Source of Sample:** B-08 **Date:**
Location: - **Depth / Elev:** 16' / 777.19'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.3	0.6	1.7	17.2	51.0	29.2

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5	100.0		
4.75	99.7		
2	99.1		
0.425	97.3		
0.075	80.1		

* (no specification provided)

Soil Description

low plasticity clay, fine sand

General Characteristics

Moisture Content = 11.6% Specific Gravity = 2.72

Atterberg Limits

LL= 21 PL= 11 PI= 10

Coefficients

D_{85}= 0.122 D_{60}= 0.031 D_{50}= 0.02
D_{30}= 0.006 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS = CL AASHTO = A-4

Remarks

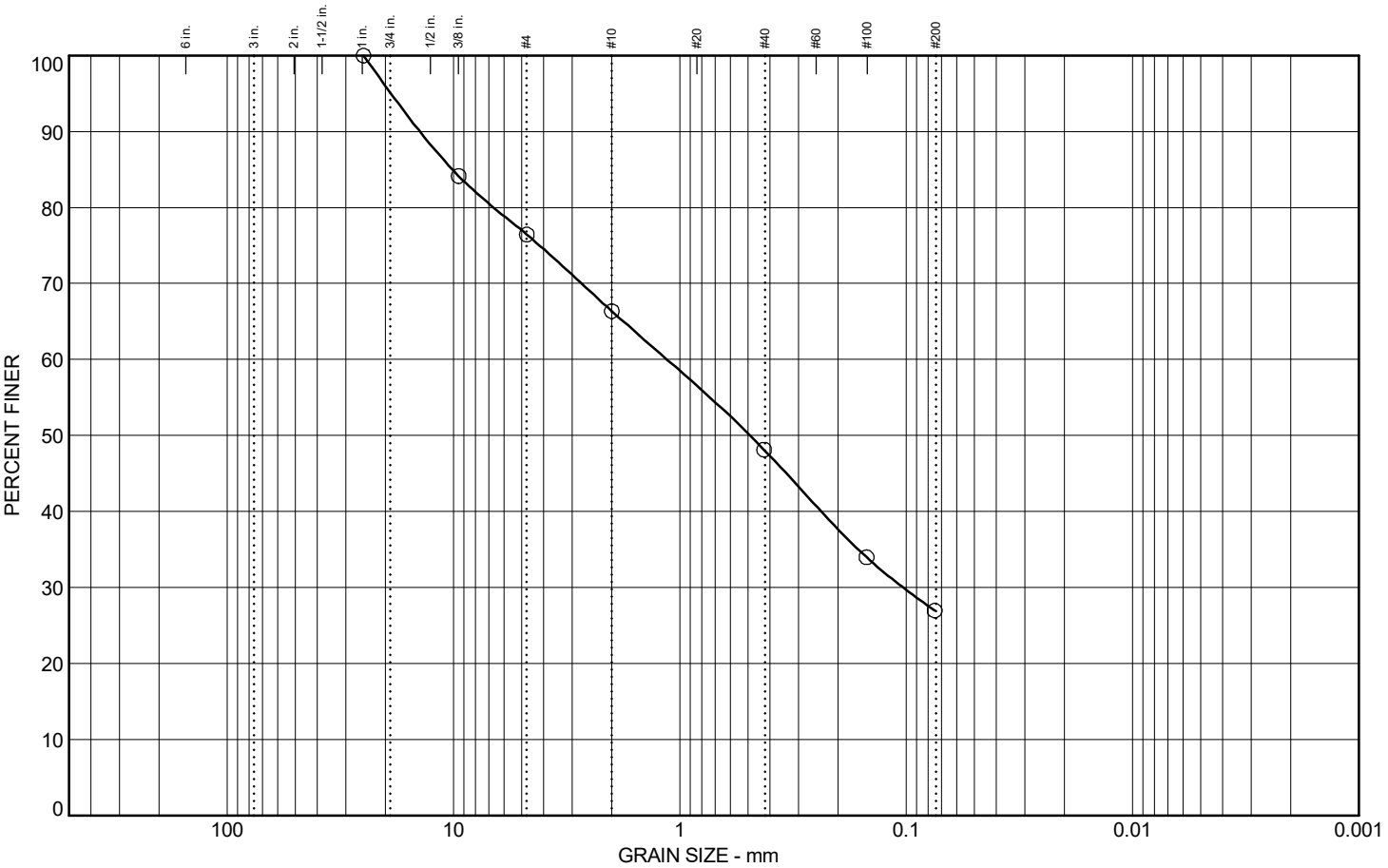
Group Index = 5

Sample No.: S-10 **Source of Sample:** B-08 **Date:**
Location: - **Depth / Elev:** 23.5' / 769.69'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	4.5	19.1	10.1	18.2	21.2	26.9	

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
25	100.0		
9.5	84.1		
4.75	76.4		
2	66.4		
0.425	48.1		
0.15	34.0		
0.075	26.9		

* (no specification provided)

Soil Description

General Characteristics

Moisture Content = %

Atterberg Limits

LL= PL= PI=

Coefficients

D_{85}= 10.008 D_{60}= 1.166 D_{50}= 0.499
D_{30}= 0.101 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS = AASHTO =

Remarks

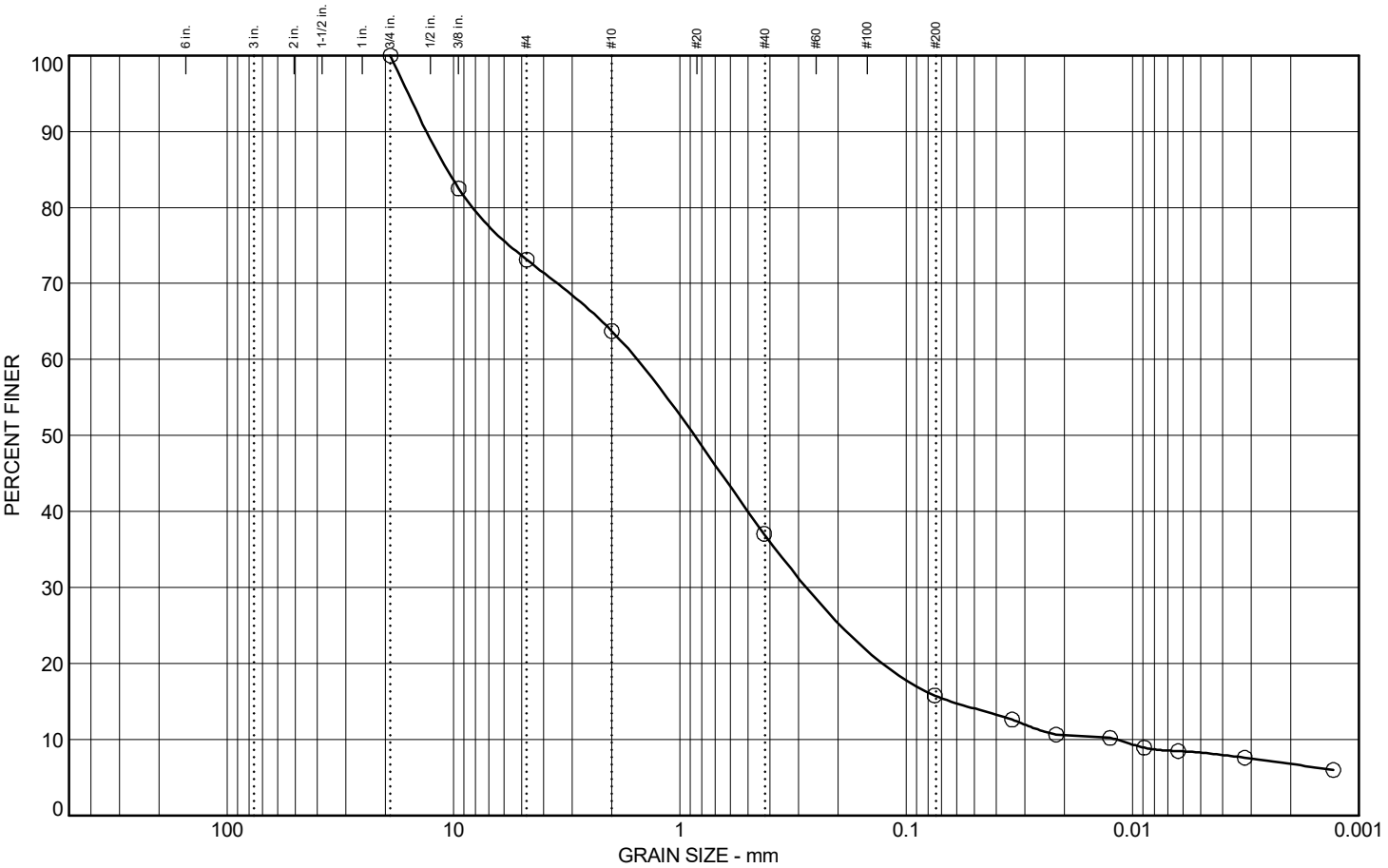
Group Index =

Sample No.: S-1 **Source of Sample:** B-09 **Date:**
Location: - **Depth / Elev:** 1' / 791.1'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	26.9	9.4	26.7	21.3	7.6	8.2

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19	100.0		
9.5	82.5		
4.75	73.1		
2	63.7		
0.425	37.1		
0.075	15.8		

* (no specification provided)

Soil Description

General Characteristics

Moisture Content = 8.5% Specific Gravity = 2.79

Atterberg Limits

LL= PL= PI=

Coefficients

D_{85}= 10.49 D_{60}= 1.61 D_{50}= 0.901
D_{30}= 0.239 D_{15}= 0.062 D_{10}= 0.012
C_u= 134.04 C_c= 2.96

Classification

USCS = AASHTO =

Remarks

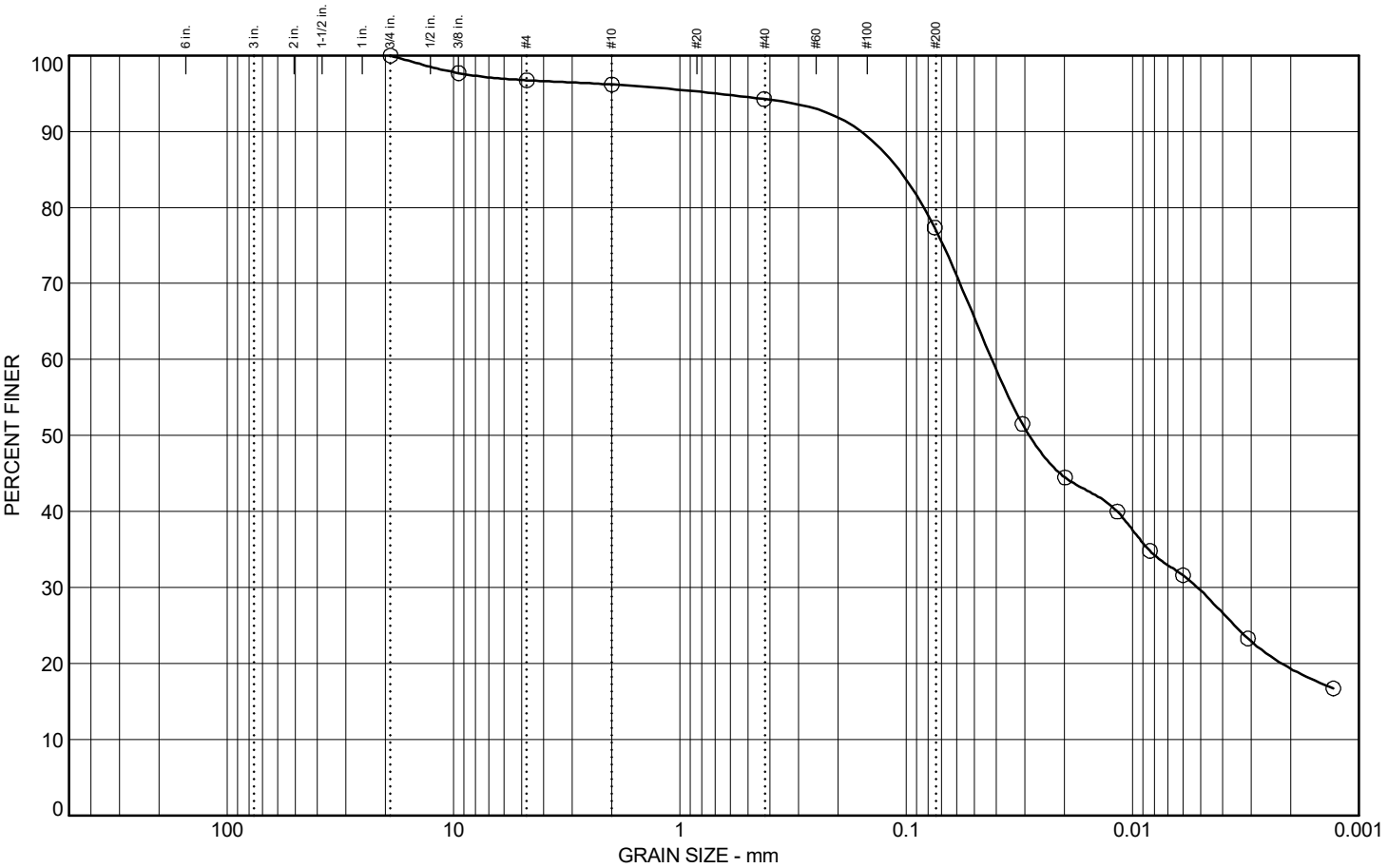
Group Index =

Sample No.: S-7 **Source of Sample:** B-09 **Date:**
Location: - **Depth / Elev:** 16' / 776.1'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	3.3	0.6	1.9	16.9	48.1	29.3

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19	100.0		
9.5	97.7		
4.75	96.7		
2	96.2		
0.425	94.3		
0.075	77.4		

* (no specification provided)

Soil Description

low plasticity clay, fine sand

General Characteristics

Moisture Content = 11.1% Specific Gravity = 2.77

Atterberg Limits

LL= 21 PL= 15 PI= 6

Coefficients

D_{85}= 0.164 D_{60}= 0.041 D_{50}= 0.028
D_{30}= 0.005 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS = CL-ML AASHTO = A-4

Remarks

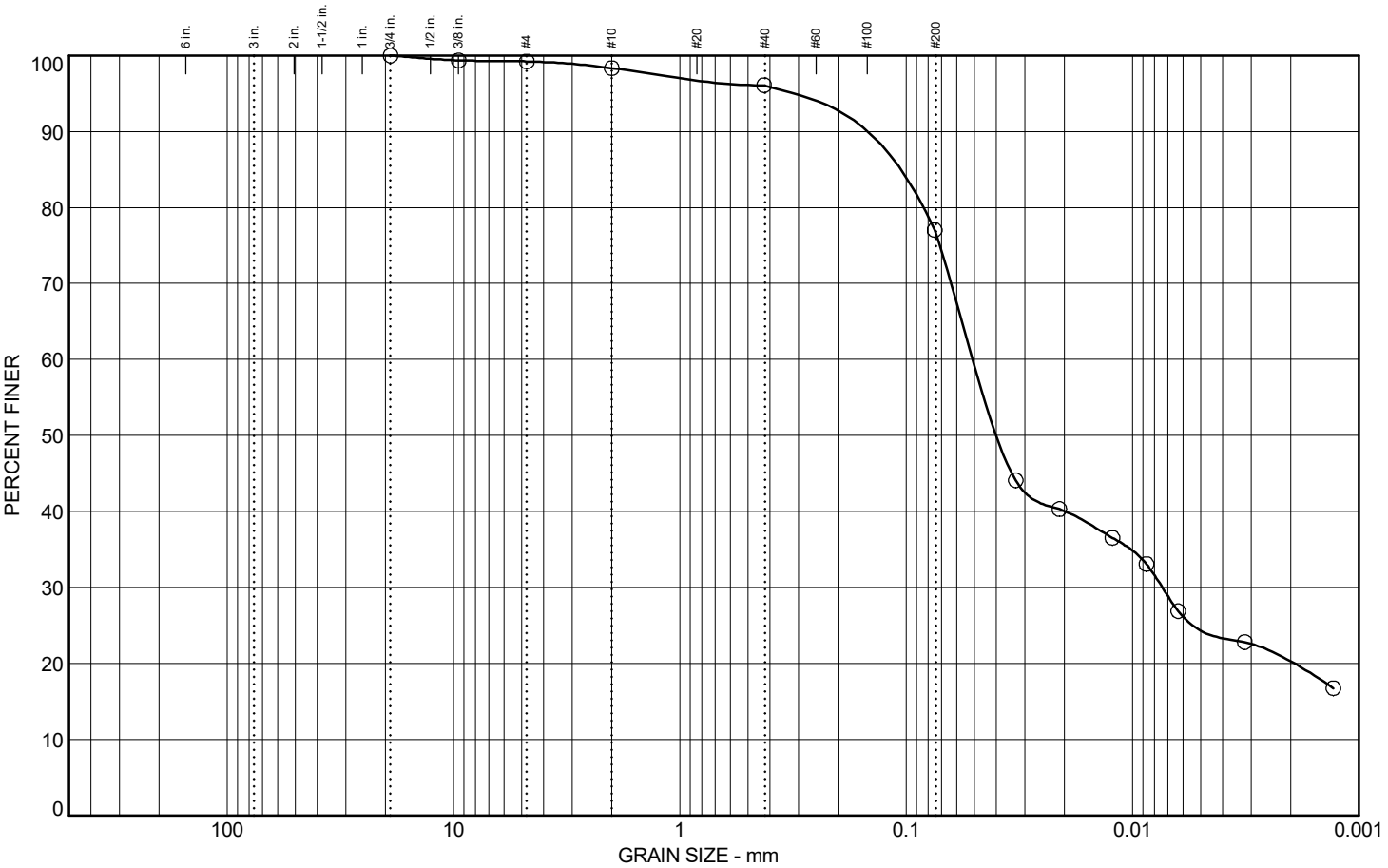
Group Index = 2

Sample No.: S-9 **Source of Sample:** B-09 **Date:**
Location: - **Depth / Elev:** 21' / 771.1'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.8	0.9	2.2	19.1	51.6	25.5

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19	100.0		
9.5	99.4		
4.75	99.2		
2	98.3		
0.425	96.1		
0.075	77.0		

* (no specification provided)

Soil Description

low plasticity silt, fine sand

General Characteristics

Moisture Content = 10.7% Specific Gravity = 2.67

Atterberg Limits

LL= 15 PL= 12 PI= 3

Coefficients

D_{85}= 0.155 D_{60}= 0.049 D_{50}= 0.038
D_{30}= 0.007 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS = ML AASHTO = A-4

Remarks

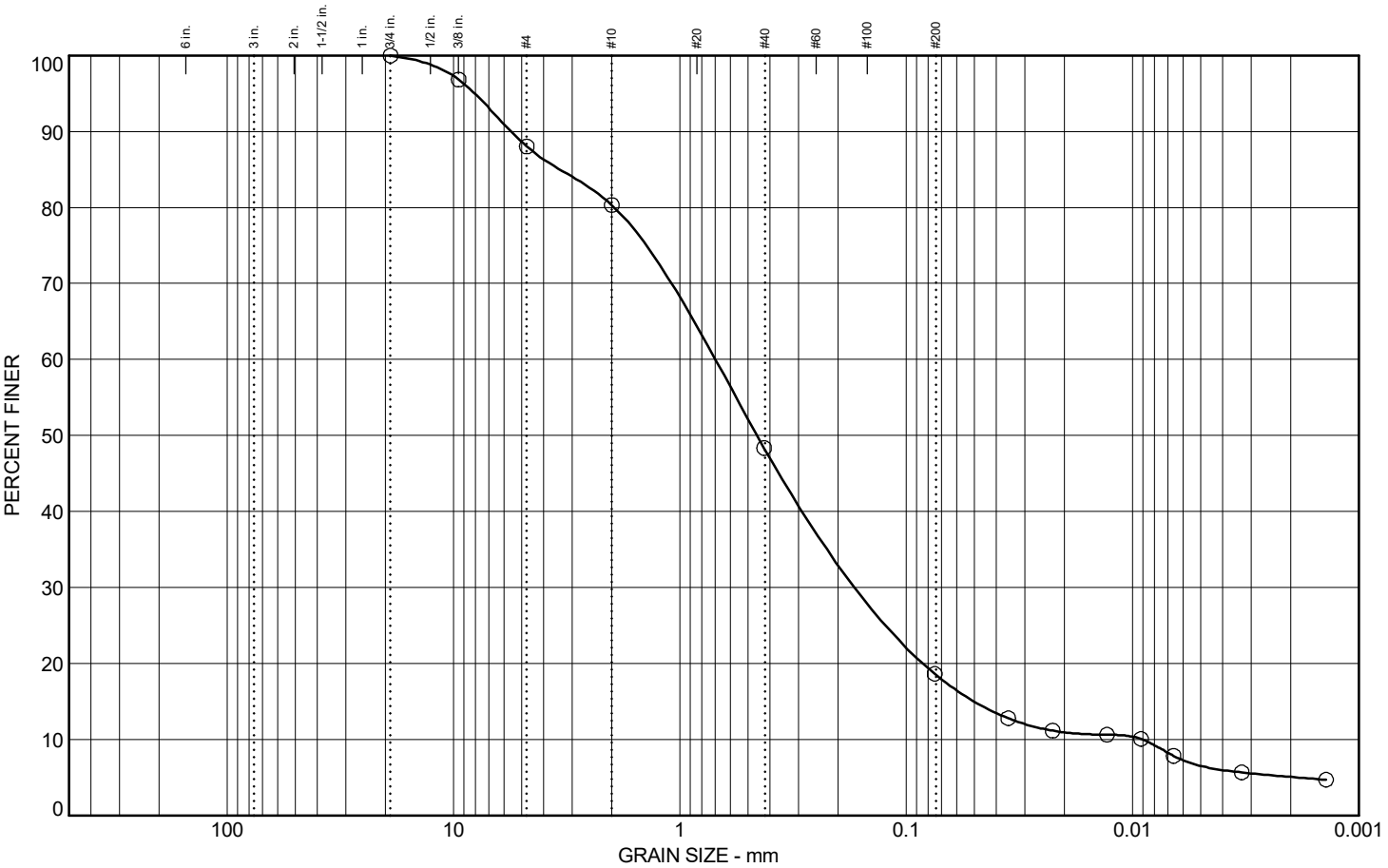
Group Index = 0

Sample No.: ST-1 **Source of Sample:** B-09 **Date:**
Location: - **Depth / Elev:** 31' / 761.1'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	12.0	7.7	32.0	29.7	11.7	7.0

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19	100.0		
9.5	96.8		
4.75	88.0		
2	80.3		
0.425	48.4		
0.075	18.6		

* (no specification provided)

Soil Description

General Characteristics

Moisture Content = 12.8% Specific Gravity = 2.68

Atterberg Limits

LL= PL= PI=

Coefficients

D_{85}= 3.38 D_{60}= 0.747 D_{50}= 0.46
D_{30}= 0.146 D_{15}= 0.047 D_{10}= 0.009
C_u= 81.84 C_c= 3.11

Classification

USCS = AASHTO =

Remarks

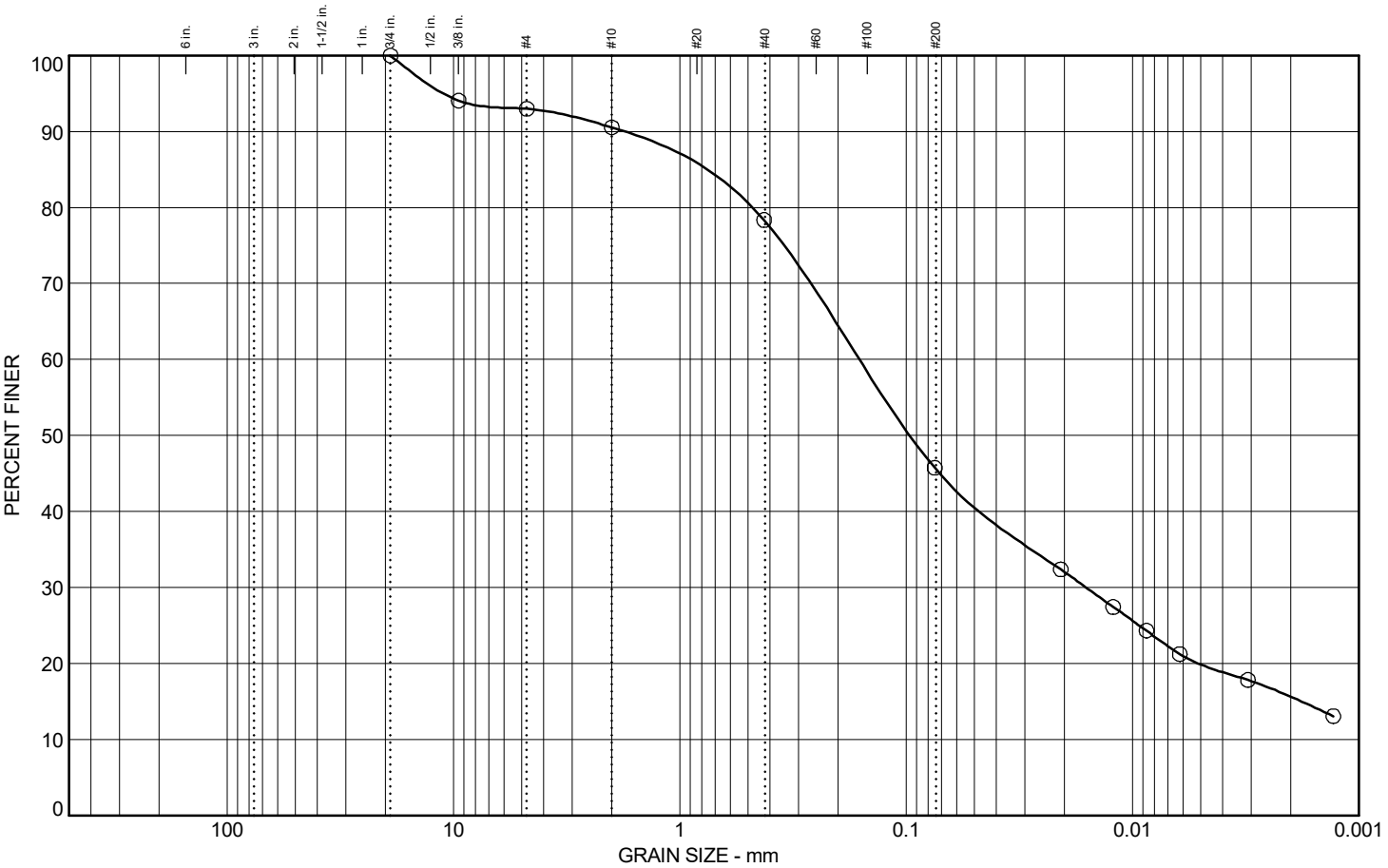
Group Index =

Sample No.: S-14 **Source of Sample:** B-09 **Date:**
Location: - **Depth / Elev:** 38.5' / 753.6'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	7.0	2.4	12.2	32.6	25.6	20.2

SIEVE SIZE (mm)	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19	100.0		
9.5	94.1		
4.75	93.0		
2	90.5		
0.425	78.3		
0.075	45.7		

* (no specification provided)

Soil Description

fine sand, low plasticity silt

General Characteristics

Moisture Content = 9.5% Specific Gravity = 2.75

Atterberg Limits

LL= 16 PL= 13 PI= 3

Coefficients

D_{85}= 0.989 D_{60}= 0.16 D_{50}= 0.094
D_{30}= 0.016 D_{15}= 0.002 D_{10}=
C_u= C_c=

Classification

USCS = SM AASHTO = A-4

Remarks

Group Index = 0

Sample No.: S-16 **Source of Sample:** B-09 **Date:**
Location: - **Depth / Elev:** 48.5' / 743.6'

DLZ

Client: City of Ann Arbor
Project: EMCD Bridge Rehabilitation
Project No: 2141-7363.00 **Figure**

Report on Loss of Ignition

(AASHTO T-267)

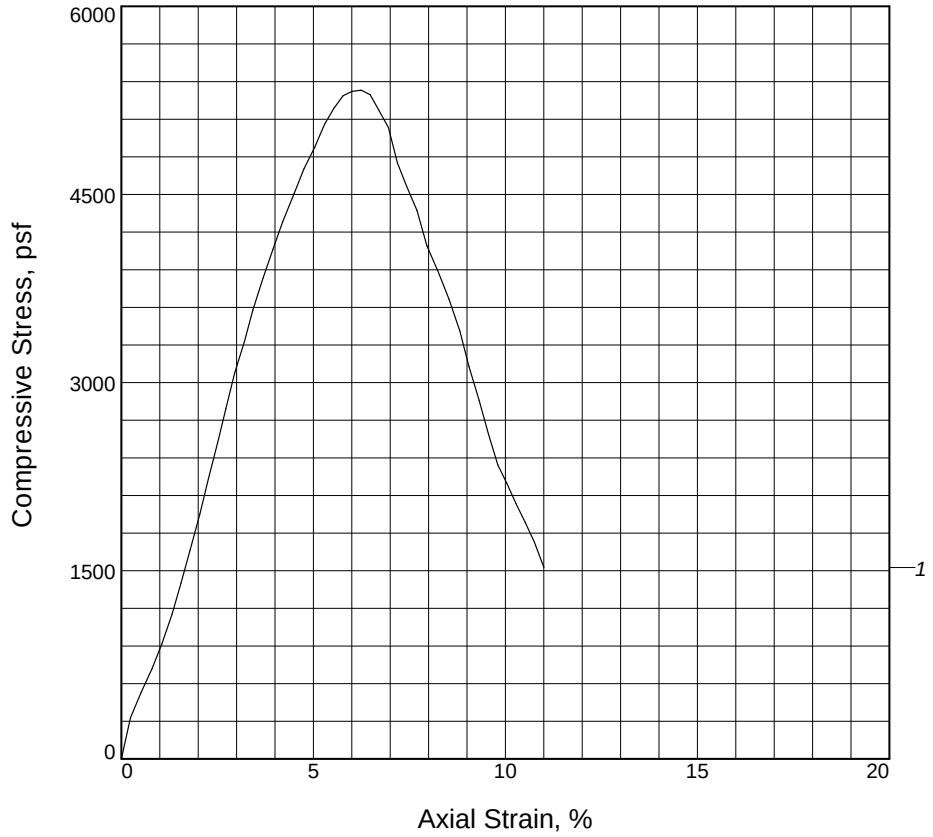
DLZ Project No.:	2141-7363.00	Boring No.	**B-06**
Client:	City of Ann Arbor	Sample No.	**S-3**
Project Name:	Ann Arbor EMCD Bridge	Depth:	**6.0'-7.2'**
Date:	2/22/2022		

Muffle Furnace Crucible ID:	M
Muffle Furnace Temperature	**455 ± 10°C**
Mass of crucible & oven dry soil (A)	87.64
Mass of crucible (B)	53.45
Mass of oven dry soil (C)	34.19
Mass of sample & crucible after ashed in muffle furnace (D)	86.45
Mass of crucible (B)	53.45
Mass of ashed soil sample (E)	33.00
Loss on Ignition = (C - E) / C * 100 =	**3.48**

Container No.	Pan
Wet Wt. + Container	143.60
Dry Wt. + Container	126.43
Wt. of Container	13.53
Dry Wt. of Soil	112.90
Moisture Content (%)	15.2

DLZ

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	5332			
Undrained shear strength, psf	2666			
Failure strain, %	6.2			
Strain rate, in./min.	0.055			
Water content, %	11.4			
Wet density, pcf	142.2			
Dry density, pcf	127.6			
Saturation, %	90.0			
Void ratio	0.3505			
Specimen diameter, in.	2.85			
Specimen height, in.	5.50			
Height/diameter ratio	1.93			

Description: Very Stiff to Hard, Gray, Silty Clay (CL-ML) with sand, Damp

LL = 19	**PL =** 13	**PI =** 6	**GS=** 2.76	**Type:** Intact

Project No.: 2141-7363.00

Date Sampled: 1/14/2022

Remarks:
Test Method: ASTM D2166

Figure _____

Client: City of Ann Arbor

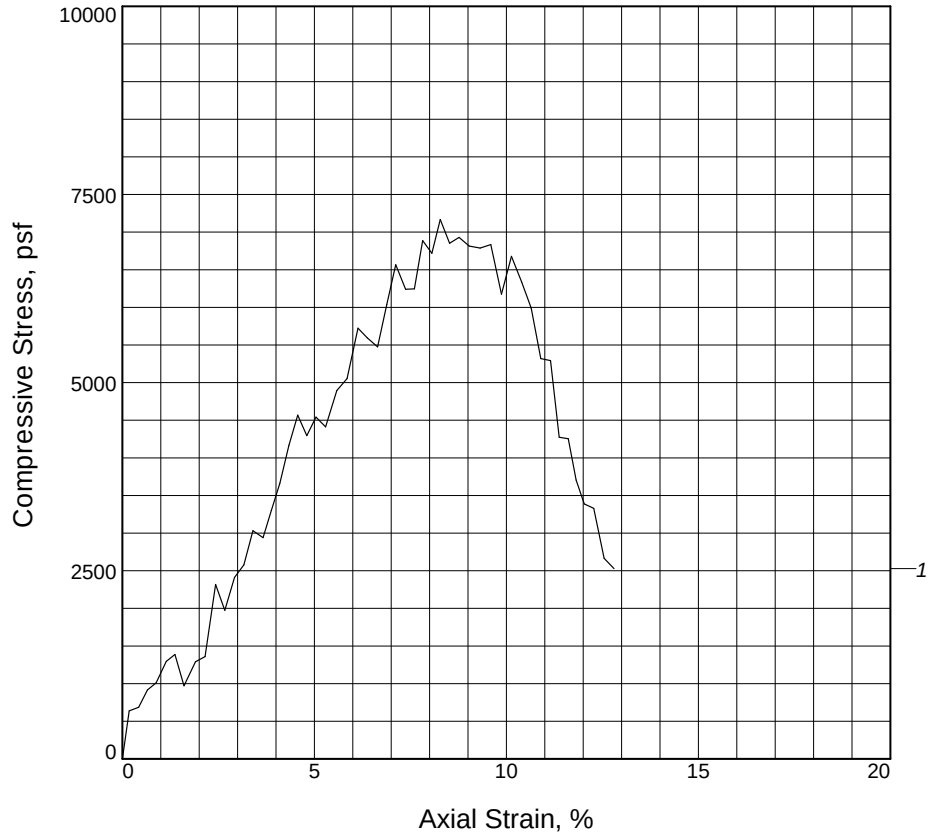
Project: Ann Arbor EMCD Bridge

Source of Sample: B-05 **Depth:** 12.5'-14.5'
Sample Number: ST-1

DLZ

Tested By: AD **Checked By:** NB

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	7168			
Undrained shear strength, psf	3584			
Failure strain, %	8.3			
Strain rate, in./min.	0.055			
Water content, %	11.1			
Wet density, pcf	142.9			
Dry density, pcf	128.6			
Saturation, %	96.3			
Void ratio	0.3105			
Specimen diameter, in.	2.86			
Specimen height, in.	5.56			
Height/diameter ratio	1.94			

Description: Very Stiff to Hard, Gray, Silty Clay (CL-ML) with sand, Damp

LL = 18	**PL =** 13	**PI =** 5	**GS=** 2.70	**Type:** Intact

Project No.: 2141-7363.00

Date Sampled: 2-12-22

Remarks:
Test Method: ASTM D2166

Figure _____

Client: City of Ann Arbor

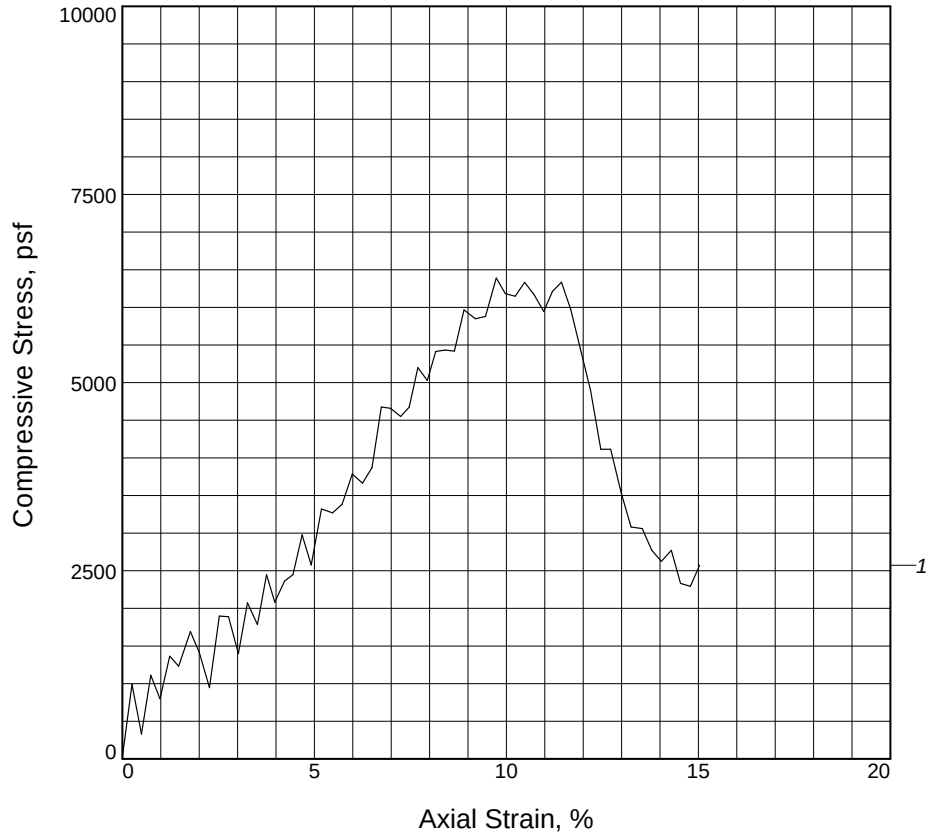
Project: Ann Arbor EMCD Bridge

Source of Sample: B-07 **Depth:** 16.0'-18.0'
Sample Number: ST-1

DLZ

Tested By: AD **Checked By:** SR

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	6389			
Undrained shear strength, psf	3194			
Failure strain, %	9.7			
Strain rate, in./min.	0.055			
Water content, %	10.9			
Wet density, pcf	143.1			
Dry density, pcf	129.0			
Saturation, %	99.9			
Void ratio	0.2920			
Specimen diameter, in.	2.83			
Specimen height, in.	5.55			
Height/diameter ratio	1.96			

Description: Very Stiff to Hard, Gray, Silt (ML) with sand, Damp

LL = 15	**PL =** 12	**PI =** 3	**GS=** 2.67	**Type:** Intact

Project No.: 2141-7363.00

Date Sampled: 2-12-22

Remarks:
Test Method: ASTM D2166

Figure _____

Client: City of Ann Arbor

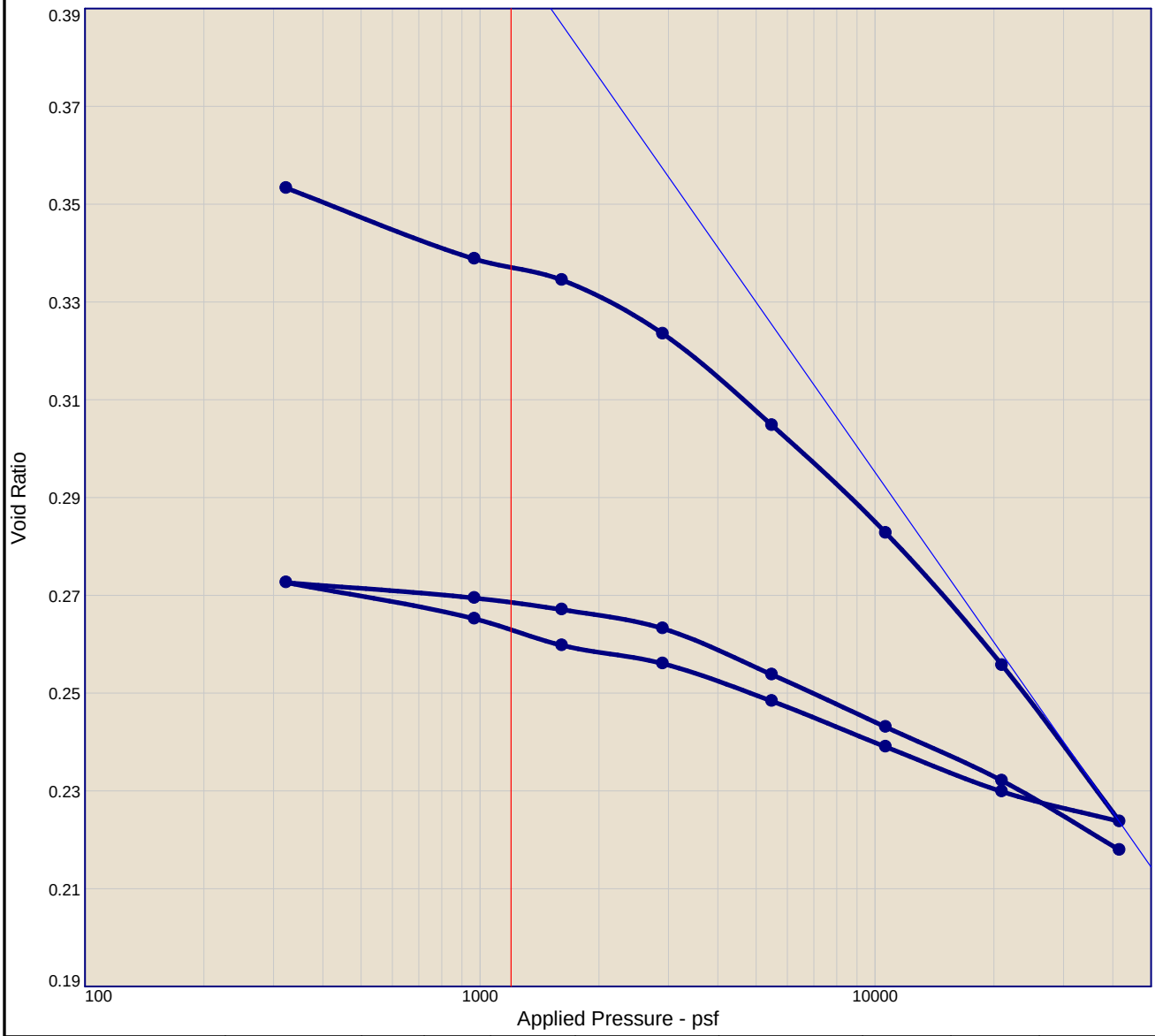
Project: Ann Arbor EMCD Bridge

Source of Sample: B-09 **Depth:** 31.0'-33.0'
Sample Number: ST-1

DLZ

Tested By: AD **Checked By:** SR

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
86.5 %	11.4 %	126.4	19	6	2.76	1240	4801	0.12	0.02	0.364

MATERIAL DESCRIPTION	USCS	AASHTO
Very Stiff to Hard, Gray, Silty Clay (CL-ML) with sand, Damp	CL-ML	A-4(2)

Project No. 2141- **Client:** City of Ann Arbor

Project: Ann Arbor EMCD Bridge

Source of Sample: B-05 **Depth:** 12.5'-14.5' **Sample Number:** ST-1

DLZ

Remarks:
Test Method: ASTM D2435

Figure

Tested By: AD **Checked By:** ST

CONSOLIDATION TEST DATA

2/22/2022

Client: City of Ann Arbor
Project: Ann Arbor EMCD Bridge
Project Number: 2141-7363.00
Location: B-05
Depth: 12.5'-14.5' **Sample Number:** ST-1
Material Description: Very Stiff to Hard, Gray, Silty Clay (CL-ML) with sand, Damp
Liquid Limit: 19 **Plasticity Index:** 6
USCS: CL-ML **AASHTO:** A-4(2)
Testing Remarks: Test Method: ASTM D2435
Tested by: AD **Checked by:** ST

Test Specimen Data

NATURAL MOISTURE

Wet w+t	=	372.86 g.
Dry w+t	=	341.19 g.
Tare Wt.	=	63.18 g.
Moisture	=	11.4 %

VOID RATIO

Spec. Gr.	=	2.76
Est. Ht. Solids	=	0.550 in.
Init. V.R.	=	0.364
Init. Sat.	=	86.5 %

AFTER TEST

Wet w+t	=	197.26 g.
Dry w+t	=	184.13 g.
Tare Wt.	=	62.26 g.
Moisture	=	10.8 %

UNIT WEIGHT

Height	=	0.750 in.
Diameter	=	2.500 in.
Weight	=	136.03 g.
Dry Dens.	=	126.4 pcf

TEST START

Height	=	0.750 in.
Diameter	=	2.500 in.

Dry Wt.	=	121.87 g.

End-Of-Load Summary

Pressure (psf)	Final Dial (in.)	Deformation (in.)	C_V (ft.^{2}/day)	C_α	Void Ratio	% Strain
start	0.00000	0.00000			0.364	
324	0.00564	0.00564			0.353	0.8 Comprs.
970	0.01361	0.01361		0.000	0.339	1.8 Comprs.
1616	0.01599	0.01599	0.065	0.000	0.334	2.1 Comprs.
2908	0.02203	0.02203		0.000	0.323	2.9 Comprs.
5492	0.03233	0.03233		0.001	0.305	4.3 Comprs.
10660	0.04443	0.04443		0.000	0.283	5.9 Comprs.
20996	0.05932	0.05932		0.002	0.256	7.9 Comprs.
41668	0.07689	0.07689		0.002	0.224	10.3 Comprs.
20996	0.07353	0.07353		0.000	0.230	9.8 Comprs.
10660	0.06850	0.06850			0.239	9.1 Comprs.
5492	0.06336	0.06336			0.248	8.4 Comprs.
2908	0.05913	0.05913			0.256	7.9 Comprs.
1616	0.05708	0.05708	0.023		0.260	7.6 Comprs.
970	0.05409	0.05409	0.056		0.265	7.2 Comprs.
324	0.05002	0.05002			0.273	6.7 Comprs.
970	0.05175	0.05175		0.000	0.269	6.9 Comprs.
1616	0.05306	0.05306	0.004	0.000	0.267	7.1 Comprs.
2908	0.05519	0.05519		0.000	0.263	7.4 Comprs.
5492	0.06038	0.06038		0.000	0.254	8.1 Comprs.
10660	0.06627	0.06627		0.000	0.243	8.8 Comprs.

End-Of-Load Summary (Continued)

Pressure (psf)	Final Dial (in.)	Deformation (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Strain
20996	0.07231	0.07231		0.000	0.232	9.6 Comprs.
41668	0.08011	0.08011		0.000	0.218	10.7 Comprs.

Compression index (C_c), psf = 0.12 **Preconsolidation pressure (P_p), psf =** 4801 **Void ratio at P_p (e_m) =** 0.309
Overburden (σ_{vo}), psf = 1240 **Void ratio at σ_{vo} (e_o) =** 0.337 **Recompression index (C_r) =** 0.02

Pressure: 324 psf **TEST READINGS** **Load No. 1**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	0.00000	13	181.0000	0.00512	25	901.0000	0.00541
2	0.1000	0.00367	14	241.0000	0.00512	26	961.0000	0.00546
3	0.2500	0.00385	15	301.0000	0.00511	27	1021.0000	0.00547
4	0.5000	0.00408	16	361.0000	0.00510	28	1081.0000	0.00549
5	1.0000	0.00410	17	421.0000	0.00510	29	1141.0000	0.00549
6	2.0000	0.00452	18	481.0000	0.00510	30	1201.0000	0.00550
7	4.0000	0.00458	19	541.0000	0.00510	31	1261.0000	0.00550
8	8.0000	0.00484	20	601.0000	0.00510	32	1321.0000	0.00565
9	16.0000	0.00495	21	661.0000	0.00508	33	1381.0000	0.00566
10	31.0000	0.00495	22	721.0000	0.00510	34	1441.0000	0.00564
11	61.0000	0.00500	23	781.0000	0.00509			
12	121.0000	0.00513	24	841.0000	0.00515			

Void Ratio = 0.353 **Compression =** 0.8%

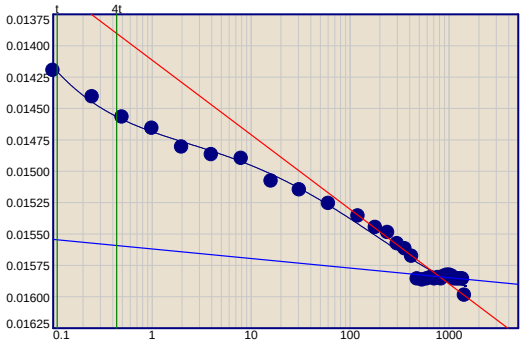
Pressure: 970 psf **TEST READINGS** **Load No. 2**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	0.00557	13	181.0000	0.01348	25	901.0000	0.01358
2	0.1000	0.01230	14	241.0000	0.01348	26	961.0000	0.01358
3	0.2500	0.01237	15	301.0000	0.01349	27	1021.0000	0.01356
4	0.5000	0.01239	16	361.0000	0.01349	28	1081.0000	0.01355
5	1.0000	0.01254	17	421.0000	0.01354	29	1141.0000	0.01356
6	2.0000	0.01259	18	481.0000	0.01356	30	1201.0000	0.01356
7	4.0000	0.01260	19	541.0000	0.01360	31	1261.0000	0.01356
8	8.0000	0.01273	20	601.0000	0.01363	32	1321.0000	0.01356
9	16.0000	0.01275	21	661.0000	0.01362	33	1381.0000	0.01357
10	31.0000	0.01302	22	721.0000	0.01362	34	1441.0000	0.01361
11	61.0000	0.01341	23	781.0000	0.01360			
12	121.0000	0.01346	24	841.0000	0.01358			

Void Ratio = 0.339 **Compression =** 1.8%

Pressure: 1616 psf	TEST READINGS	Load No. 3

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	0.01361	18	481.0000	0.01586
2	0.1000	0.01420	19	541.0000	0.01587
3	0.2500	0.01441	20	601.0000	0.01586
4	0.5000	0.01457	21	661.0000	0.01585
5	1.0000	0.01466	22	721.0000	0.01586
6	2.0000	0.01481	23	781.0000	0.01585
7	4.0000	0.01487	24	841.0000	0.01586
8	8.0000	0.01490	25	901.0000	0.01584
9	16.0000	0.01508	26	961.0000	0.01583
10	31.0000	0.01515	27	1021.0000	0.01583
11	61.0000	0.01526	28	1081.0000	0.01584
12	121.0000	0.01536	29	1141.0000	0.01586
13	181.0000	0.01545	30	1201.0000	0.01586
14	241.0000	0.01549	31	1261.0000	0.01586
15	301.0000	0.01558	32	1321.0000	0.01586
16	361.0000	0.01562	33	1381.0000	0.01586
17	421.0000	0.01568	34	1441.0000	0.01599



Void Ratio = 0.334 **Compression =** 2.1%

D_0 = 0.0138 **D_{50} =** 0.0148 **D_{100} =** 0.0158 **C_v at 4.11 min. =** 0.065 ft.^{2}/day **C_α =** 0.000

Pressure: 2908 psf	TEST READINGS	Load No. 4

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	0.01630	13	181.0000	0.02108	25	901.0000	0.02177
2	0.1000	0.01932	14	241.0000	0.02134	26	961.0000	0.02176
3	0.2500	0.01960	15	301.0000	0.02150	27	1021.0000	0.02177
4	0.5000	0.01979	16	361.0000	0.02153	28	1081.0000	0.02176
5	1.0000	0.02001	17	421.0000	0.02161	29	1141.0000	0.02176
6	2.0000	0.02020	18	481.0000	0.02160	30	1201.0000	0.02175
7	4.0000	0.02030	19	541.0000	0.02163	31	1261.0000	0.02175
8	8.0000	0.02037	20	601.0000	0.02176	32	1321.0000	0.02176
9	16.0000	0.02051	21	661.0000	0.02177	33	1381.0000	0.02185
10	31.0000	0.02061	22	721.0000	0.02176	34	1441.0000	0.02203
11	61.0000	0.02069	23	781.0000	0.02177			
12	121.0000	0.02086	24	841.0000	0.02177			

Void Ratio = 0.323 **Compression =** 2.9%

Pressure: 5492 psf	TEST READINGS	Load No. 5

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	0.02199	13	181.0000	0.03147	25	901.0000	0.03203
2	0.1000	0.02771	14	241.0000	0.03160	26	961.0000	0.03201
3	0.2500	0.02832	15	301.0000	0.03168	27	1021.0000	0.03202
4	0.5000	0.02876	16	361.0000	0.03175	28	1081.0000	0.03206
5	1.0000	0.02908	17	421.0000	0.03183	29	1141.0000	0.03205
6	2.0000	0.02942	18	481.0000	0.03197	30	1201.0000	0.03209
7	4.0000	0.02965	19	541.0000	0.03199	31	1261.0000	0.03206
8	8.0000	0.02999	20	601.0000	0.03203	32	1321.0000	0.03216
9	16.0000	0.03036	21	661.0000	0.03206	33	1381.0000	0.03218
10	31.0000	0.03064	22	721.0000	0.03205	34	1441.0000	0.03233
11	61.0000	0.03104	23	781.0000	0.03203			
12	121.0000	0.03144	24	841.0000	0.03204			

Void Ratio = 0.305 **Compression =** 4.3%

Pressure: 10660 psf	TEST READINGS	Load No. 6

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	0.03228	13	181.0000	0.04374	25	901.0000	0.04420
2	0.1000	0.03937	14	241.0000	0.04390	26	961.0000	0.04421
3	0.2500	0.04001	15	301.0000	0.04396	27	1021.0000	0.04420
4	0.5000	0.04062	16	361.0000	0.04409	28	1081.0000	0.04421
5	1.0000	0.04103	17	421.0000	0.04412	29	1141.0000	0.04424
6	2.0000	0.04138	18	481.0000	0.04418	30	1201.0000	0.04428
7	4.0000	0.04178	19	541.0000	0.04420	31	1261.0000	0.04430
8	8.0000	0.04221	20	601.0000	0.04420	32	1321.0000	0.04432
9	16.0000	0.04263	21	661.0000	0.04418	33	1381.0000	0.04440
10	31.0000	0.04315	22	721.0000	0.04418	34	1441.0000	0.04443
11	61.0000	0.04343	23	781.0000	0.04418			
12	121.0000	0.04365	24	841.0000	0.04418			

Void Ratio = 0.283 **Compression =** 5.9%

Pressure: 20996 psf	TEST READINGS	Load No. 7

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	0.04469	13	181.0000	0.05838	25	901.0000	0.05893
2	0.1000	0.05268	14	241.0000	0.05840	26	961.0000	0.05897
3	0.2500	0.05394	15	301.0000	0.05844	27	1021.0000	0.05899
4	0.5000	0.05444	16	361.0000	0.05861	28	1081.0000	0.05901
5	1.0000	0.05488	17	421.0000	0.05869	29	1141.0000	0.05914
6	2.0000	0.05545	18	481.0000	0.05870	30	1201.0000	0.05923
7	4.0000	0.05597	19	541.0000	0.05879	31	1261.0000	0.05932
8	8.0000	0.05676	20	601.0000	0.05879	32	1321.0000	0.05932
9	16.0000	0.05717	21	661.0000	0.05879	33	1381.0000	0.05931
10	31.0000	0.05762	22	721.0000	0.05883	34	1441.0000	0.05932
11	61.0000	0.05782	23	781.0000	0.05888			
12	121.0000	0.05820	24	841.0000	0.05889			

Void Ratio = 0.256 **Compression =** 7.9%

Pressure: 41668 psf	TEST READINGS	Load No. 8

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	0.05938	13	181.0000	0.07536	25	901.0000	0.07634
2	0.1000	0.06876	14	241.0000	0.07559	26	961.0000	0.07639
3	0.2500	0.06962	15	301.0000	0.07563	27	1021.0000	0.07642
4	0.5000	0.07055	16	361.0000	0.07572	28	1081.0000	0.07645
5	1.0000	0.07134	17	421.0000	0.07586	29	1141.0000	0.07678
6	2.0000	0.07218	18	481.0000	0.07612	30	1201.0000	0.07677
7	4.0000	0.07281	19	541.0000	0.07613	31	1261.0000	0.07685
8	8.0000	0.07332	20	601.0000	0.07613	32	1321.0000	0.07682
9	16.0000	0.07363	21	661.0000	0.07617	33	1381.0000	0.07686
10	31.0000	0.07411	22	721.0000	0.07619	34	1441.0000	0.07689
11	61.0000	0.07447	23	781.0000	0.07628			
12	121.0000	0.07516	24	841.0000	0.07630			

Void Ratio = 0.224 **Compression =** 10.3%

Pressure: 20996 psf	TEST READINGS	Load No. 9

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	0.07689	13	180.9833	0.07352	25	900.9833	0.07353
2	0.0833	0.07330	14	240.9833	0.07352	26	960.9833	0.07353
3	0.2333	0.07345	15	300.9833	0.07351	27	1020.9833	0.07354
4	0.4833	0.07356	16	360.9833	0.07352	28	1080.9833	0.07352
5	0.9833	0.07361	17	420.9833	0.07351	29	1140.9833	0.07353
6	1.9833	0.07360	18	480.9833	0.07352	30	1200.9833	0.07352
7	3.9833	0.07358	19	540.9833	0.07352	31	1260.9833	0.07350
8	7.9833	0.07358	20	600.9833	0.07352	32	1320.9833	0.07349
9	15.9833	0.07358	21	660.9833	0.07353	33	1380.9833	0.07352
10	30.9833	0.07357	22	720.9833	0.07353	34	1440.9833	0.07353
11	60.9833	0.07357	23	780.9833	0.07353			
12	120.9833	0.07355	24	840.9833	0.07353			

Void Ratio = 0.230 **Compression =** 9.8%

Pressure: 10660 psf	TEST READINGS	Load No. 10

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	0.07342	13	180.9833	0.06860	25	900.9833	0.06857
2	0.0833	0.06911	14	240.9833	0.06859	26	960.9833	0.06856
3	0.2333	0.06908	15	300.9833	0.06859	27	1020.9833	0.06848
4	0.4833	0.06900	16	360.9833	0.06858	28	1080.9833	0.06848
5	0.9833	0.06898	17	420.9833	0.06858	29	1140.9833	0.06849
6	1.9833	0.06894	18	480.9833	0.06858	30	1200.9833	0.06851
7	3.9833	0.06884	19	540.9833	0.06859	31	1260.9833	0.06849
8	7.9833	0.06882	20	600.9833	0.06858	32	1320.9833	0.06851
9	15.9833	0.06881	21	660.9833	0.06857	33	1380.9833	0.06850
10	30.9833	0.06865	22	720.9833	0.06858	34	1440.9833	0.06850
11	60.9833	0.06866	23	780.9833	0.06857			
12	120.9833	0.06861	24	840.9833	0.06855			

Void Ratio = 0.239 **Compression =** 9.1%

Pressure: 5492 psf	TEST READINGS	Load No. 11

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	0.06850	13	181.0000	0.06370	25	901.0000	0.06351
2	0.1000	0.06466	14	241.0000	0.06368	26	961.0000	0.06351
3	0.2500	0.06455	15	301.0000	0.06367	27	1021.0000	0.06350
4	0.5000	0.06444	16	361.0000	0.06367	28	1081.0000	0.06351
5	1.0000	0.06433	17	421.0000	0.06363	29	1141.0000	0.06349
6	2.0000	0.06421	18	481.0000	0.06360	30	1201.0000	0.06349
7	4.0000	0.06412	19	541.0000	0.06360	31	1261.0000	0.06348
8	8.0000	0.06408	20	601.0000	0.06352	32	1321.0000	0.06348
9	16.0000	0.06399	21	661.0000	0.06351	33	1381.0000	0.06335
10	31.0000	0.06393	22	721.0000	0.06351	34	1441.0000	0.06336
11	61.0000	0.06384	23	781.0000	0.06352			
12	121.0000	0.06381	24	841.0000	0.06351			

Void Ratio = 0.248 **Compression =** 8.4%

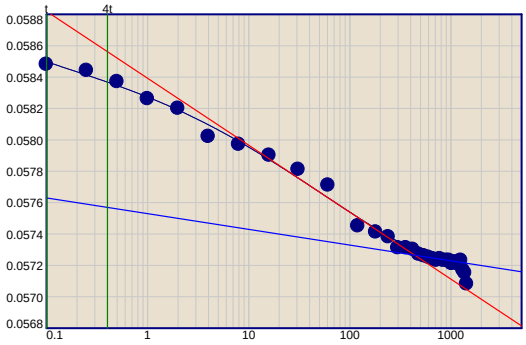
Pressure: 2908 psf	TEST READINGS	Load No. 12

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	0.06341	13	181.0000	0.05948	25	901.0000	0.05919
2	0.1000	0.06088	14	241.0000	0.05929	26	961.0000	0.05919
3	0.2500	0.06072	15	301.0000	0.05925	27	1021.0000	0.05920
4	0.5000	0.06058	16	361.0000	0.05925	28	1081.0000	0.05918
5	1.0000	0.06038	17	421.0000	0.05922	29	1141.0000	0.05918
6	2.0000	0.06031	18	481.0000	0.05920	30	1201.0000	0.05918
7	4.0000	0.06014	19	541.0000	0.05920	31	1261.0000	0.05918
8	8.0000	0.06005	20	601.0000	0.05921	32	1321.0000	0.05916
9	16.0000	0.05989	21	661.0000	0.05919	33	1381.0000	0.05915
10	31.0000	0.05986	22	721.0000	0.05919	34	1441.0000	0.05913
11	61.0000	0.05963	23	781.0000	0.05920			
12	121.0000	0.05949	24	841.0000	0.05919			

Void Ratio = 0.256 **Compression =** 7.9%

Pressure: 1616 psf | **TEST READINGS** | **Load No. 13**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	0.05900	18	481.0000	0.05727
2	0.1000	0.05848	19	541.0000	0.05726
3	0.2500	0.05844	20	601.0000	0.05725
4	0.5000	0.05837	21	661.0000	0.05724
5	1.0000	0.05826	22	721.0000	0.05723
6	2.0000	0.05820	23	781.0000	0.05724
7	4.0000	0.05802	24	841.0000	0.05723
8	8.0000	0.05797	25	901.0000	0.05723
9	16.0000	0.05790	26	961.0000	0.05723
10	31.0000	0.05781	27	1021.0000	0.05721
11	61.0000	0.05771	28	1081.0000	0.05722
12	121.0000	0.05745	29	1141.0000	0.05721
13	181.0000	0.05741	30	1201.0000	0.05722
14	241.0000	0.05738	31	1261.0000	0.05723
15	301.0000	0.05731	32	1321.0000	0.05717
16	361.0000	0.05731	33	1381.0000	0.05715
17	421.0000	0.05730	34	1441.0000	0.05708

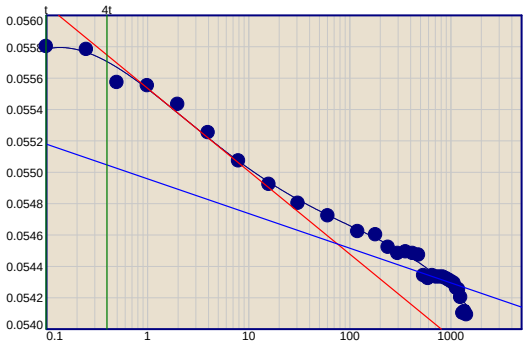


Void Ratio = 0.260 **Compression =** 7.6%

D_0 = 0.0586 **D_{50} =** 0.0579 **D_{100} =** 0.0573 **C_v at 10.42 min. =** 0.023 ft.^{2}/day

Pressure: 970 psf | **TEST READINGS** | **Load No. 14**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	0.05644	18	481.0000	0.05447
2	0.1000	0.05580	19	541.0000	0.05434
3	0.2500	0.05578	20	601.0000	0.05432
4	0.5000	0.05557	21	661.0000	0.05434
5	1.0000	0.05555	22	721.0000	0.05433
6	2.0000	0.05543	23	781.0000	0.05433
7	4.0000	0.05525	24	841.0000	0.05433
8	8.0000	0.05507	25	901.0000	0.05432
9	16.0000	0.05492	26	961.0000	0.05431
10	31.0000	0.05480	27	1021.0000	0.05430
11	61.0000	0.05472	28	1081.0000	0.05429
12	121.0000	0.05462	29	1141.0000	0.05426
13	181.0000	0.05460	30	1201.0000	0.05425
14	241.0000	0.05452	31	1261.0000	0.05420
15	301.0000	0.05448	32	1321.0000	0.05410
16	361.0000	0.05449	33	1381.0000	0.05411
17	421.0000	0.05448	34	1441.0000	0.05409



Void Ratio = 0.265 **Compression =** 7.2%

D_0 = 0.0559 **D_{50} =** 0.0552 **D_{100} =** 0.0545 **C_v at 4.27 min. =** 0.056 ft.^{2}/day

Pressure: 324 psf	TEST READINGS	Load No. 15

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	0.05410	13	180.9833	0.05046	25	900.9833	0.05020
2	0.0833	0.05071	14	240.9833	0.05043	26	960.9833	0.05020
3	0.2333	0.05127	15	300.9833	0.05033	27	1020.9833	0.05020
4	0.4833	0.05127	16	360.9833	0.05031	28	1080.9833	0.05014
5	0.9833	0.05125	17	420.9833	0.05029	29	1140.9833	0.05012
6	1.9833	0.05125	18	480.9833	0.05028	30	1200.9833	0.05005
7	3.9833	0.05117	19	540.9833	0.05027	31	1260.9833	0.05004
8	7.9833	0.05113	20	600.9833	0.05024	32	1320.9833	0.05005
9	15.9833	0.05105	21	660.9833	0.05023	33	1380.9833	0.05005
10	30.9833	0.05088	22	720.9833	0.05023	34	1440.9833	0.05002
11	60.9833	0.05069	23	780.9833	0.05022			
12	120.9833	0.05056	24	840.9833	0.05021			

Void Ratio = 0.273 **Compression =** 6.7%

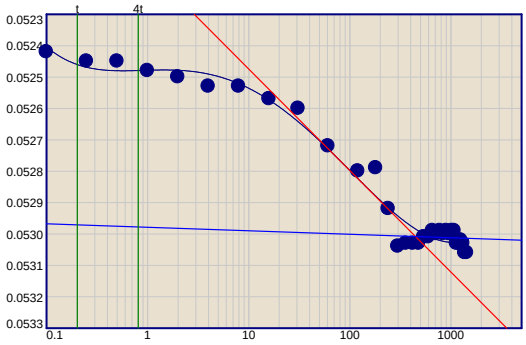
Pressure: 970 psf	TEST READINGS	Load No. 16

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	0.05003	13	181.0000	0.05164	25	901.0000	0.05172
2	0.1000	0.05141	14	241.0000	0.05167	26	961.0000	0.05172
3	0.2500	0.05140	15	301.0000	0.05173	27	1021.0000	0.05170
4	0.5000	0.05141	16	361.0000	0.05173	28	1081.0000	0.05171
5	1.0000	0.05158	17	421.0000	0.05172	29	1141.0000	0.05171
6	2.0000	0.05160	18	481.0000	0.05172	30	1201.0000	0.05172
7	4.0000	0.05159	19	541.0000	0.05172	31	1261.0000	0.05173
8	8.0000	0.05162	20	601.0000	0.05172	32	1321.0000	0.05176
9	16.0000	0.05162	21	661.0000	0.05172	33	1381.0000	0.05176
10	31.0000	0.05163	22	721.0000	0.05172	34	1441.0000	0.05175
11	61.0000	0.05165	23	781.0000	0.05172			
12	121.0000	0.05164	24	841.0000	0.05172			

Void Ratio = 0.269 **Compression =** 6.9%

Pressure: 1616 psf	TEST READINGS	Load No. 17

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	0.05226	18	481.0000	0.05303
2	0.1000	0.05242	19	541.0000	0.05301
3	0.2500	0.05245	20	601.0000	0.05301
4	0.5000	0.05245	21	661.0000	0.05299
5	1.0000	0.05248	22	721.0000	0.05300
6	2.0000	0.05250	23	781.0000	0.05299
7	4.0000	0.05253	24	841.0000	0.05300
8	8.0000	0.05253	25	901.0000	0.05299
9	16.0000	0.05257	26	961.0000	0.05300
10	31.0000	0.05260	27	1021.0000	0.05299
11	61.0000	0.05272	28	1081.0000	0.05299
12	121.0000	0.05280	29	1141.0000	0.05303
13	181.0000	0.05279	30	1201.0000	0.05303
14	241.0000	0.05292	31	1261.0000	0.05302
15	301.0000	0.05304	32	1321.0000	0.05303
16	361.0000	0.05303	33	1381.0000	0.05306
17	421.0000	0.05303	34	1441.0000	0.05306



Void Ratio = 0.267 **Compression =** 7.1%

D_0 = 0.0524 **D_{50} =** 0.0527 **D_{100} =** 0.0530 **C_v at 59.01 min. =** 0.004 ft.^{2}/day **C_α =** 0.000

Pressure: 2908 psf	TEST READINGS	Load No. 18

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	0.05309	13	181.0000	0.05560	25	901.0000	0.05567
2	0.1000	0.05448	14	241.0000	0.05561	26	961.0000	0.05567
3	0.2500	0.05465	15	301.0000	0.05568	27	1021.0000	0.05566
4	0.5000	0.05473	16	361.0000	0.05568	28	1081.0000	0.05566
5	1.0000	0.05484	17	421.0000	0.05568	29	1141.0000	0.05567
6	2.0000	0.05497	18	481.0000	0.05568	30	1201.0000	0.05569
7	4.0000	0.05506	19	541.0000	0.05567	31	1261.0000	0.05571
8	8.0000	0.05512	20	601.0000	0.05568	32	1321.0000	0.05520
9	16.0000	0.05515	21	661.0000	0.05569	33	1381.0000	0.05521
10	31.0000	0.05524	22	721.0000	0.05568	34	1441.0000	0.05519
11	61.0000	0.05533	23	781.0000	0.05568			
12	121.0000	0.05537	24	841.0000	0.05567			

Void Ratio = 0.263 **Compression =** 7.4%

Pressure: 5492 psf	TEST READINGS	Load No. 19

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	0.05518	13	180.9833	0.06002	25	900.9833	0.06011
2	0.0833	0.05887	14	240.9833	0.06008	26	960.9833	0.06010
3	0.2333	0.05905	15	300.9833	0.06010	27	1020.9833	0.06010
4	0.4833	0.05924	16	360.9833	0.06009	28	1080.9833	0.06009
5	0.9833	0.05940	17	420.9833	0.06009	29	1140.9833	0.06009
6	1.9833	0.05951	18	480.9833	0.06010	30	1200.9833	0.06012
7	3.9833	0.05952	19	540.9833	0.06010	31	1260.9833	0.06015
8	7.9833	0.05955	20	600.9833	0.06010	32	1320.9833	0.06023
9	15.9833	0.05970	21	660.9833	0.06010	33	1380.9833	0.06036
10	30.9833	0.05979	22	720.9833	0.06011	34	1440.9833	0.06038
11	60.9833	0.05992	23	780.9833	0.06010			
12	120.9833	0.05998	24	840.9833	0.06010			

Void Ratio = 0.254 **Compression =** 8.1%

Pressure: 10660 psf	TEST READINGS	Load No. 20

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	0.06042	13	181.0000	0.06576	25	901.0000	0.06586
2	0.1000	0.06480	14	241.0000	0.06578	26	961.0000	0.06585
3	0.2500	0.06513	15	301.0000	0.06588	27	1021.0000	0.06584
4	0.5000	0.06517	16	361.0000	0.06587	28	1081.0000	0.06588
5	1.0000	0.06520	17	421.0000	0.06586	29	1141.0000	0.06598
6	2.0000	0.06529	18	481.0000	0.06586	30	1201.0000	0.06598
7	4.0000	0.06539	19	541.0000	0.06587	31	1261.0000	0.06598
8	8.0000	0.06539	20	601.0000	0.06585	32	1321.0000	0.06597
9	16.0000	0.06547	21	661.0000	0.06585	33	1381.0000	0.06597
10	31.0000	0.06549	22	721.0000	0.06586	34	1441.0000	0.06627
11	61.0000	0.06569	23	781.0000	0.06586			
12	121.0000	0.06572	24	841.0000	0.06585			

Void Ratio = 0.243 **Compression =** 8.8%

Pressure: 20996 psf	TEST READINGS	Load No. 21

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	0.06627	13	181.0000	0.07151	25	901.0000	0.07185
2	0.1000	0.07010	14	241.0000	0.07156	26	961.0000	0.07185
3	0.2500	0.07051	15	301.0000	0.07171	27	1021.0000	0.07191
4	0.5000	0.07066	16	361.0000	0.07170	28	1081.0000	0.07204
5	1.0000	0.07076	17	421.0000	0.07170	29	1141.0000	0.07205
6	2.0000	0.07090	18	481.0000	0.07169	30	1201.0000	0.07207
7	4.0000	0.07100	19	541.0000	0.07169	31	1261.0000	0.07210
8	8.0000	0.07109	20	601.0000	0.07167	32	1321.0000	0.07211
9	16.0000	0.07117	21	661.0000	0.07169	33	1381.0000	0.07212
10	31.0000	0.07127	22	721.0000	0.07178	34	1441.0000	0.07231
11	61.0000	0.07137	23	781.0000	0.07177			
12	121.0000	0.07144	24	841.0000	0.07179			

Void Ratio = 0.232 **Compression =** 9.6%

Pressure: 41668 psf	TEST READINGS	Load No. 22

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.0000	0.07231	13	181.0000	0.07877	25	901.0000	0.07964
2	0.1000	0.07691	14	241.0000	0.07881	26	961.0000	0.07967
3	0.2500	0.07715	15	301.0000	0.07897	27	1021.0000	0.07967
4	0.5000	0.07723	16	361.0000	0.07907	28	1081.0000	0.07990
5	1.0000	0.07737	17	421.0000	0.07922	29	1141.0000	0.08006
6	2.0000	0.07750	18	481.0000	0.07960	30	1201.0000	0.08008
7	4.0000	0.07766	19	541.0000	0.07961	31	1261.0000	0.08011
8	8.0000	0.07774	20	601.0000	0.07960	32	1321.0000	0.08009
9	16.0000	0.07793	21	661.0000	0.07961	33	1381.0000	0.08011
10	31.0000	0.07807	22	721.0000	0.07962	34	1441.0000	0.08011
11	61.0000	0.07824	23	781.0000	0.07962			
12	121.0000	0.07853	24	841.0000	0.07962			

Void Ratio = 0.218 **Compression =** 10.7%